SPEEDSTAR

Phase Converter Drive Product Manual

POLYSPEDE

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PREFACE

Thank you for choosing POLYSPEDE'S Spedestar PC1 Series Drive. Spedestar PC1 Series are Sensor-less current vector control high-performance Drives. They were manufactured by adopting high-quality components, material and incorporating the latest microprocessor technology available.
This renewed user manual, revised the errors on previous 6328 edition.
We changed the order of Chapter 5 and Chapter 6. The major difference is the Firmware version update from 1.xx to 2.xx. The 2.xx version is more powerful, total parameter number is over 500.
The main differences are below:

New functions of Firmware version 2.xx (a symbol '♦'will be shown on its parameter no.)

	Functions	Relative Parameters
1	Provide Parameters Read/Save/Copy function (Need a PU-02)	
2	Parameter reset for 50/60Hz, 240V	Pr0-02
3	Source of the Master Frequency Command from PG	Pr0-18
4	Parameter Team selection	Pr0-25
5	Skip Frequency up to 6	Pr1-24~Pr1-35
6	2nd V/F curve setting	Pr1-36~Pr1-42
7	FWD/REV terminals action by Level Trigger	Pr2-07
8	Delay time of Multi-Function Output terminals	Pr2-19
9	PLC Run Operation Mode after recovering from power interruption	Pr4-33
10	Fault Record up to 16	Pr5-24~Pr5-39
11	Motor 2 parameters	Pr5-40~Pr5-46
12	Motor selection between Y and Δ as well as between 2 motors	Pr5-48~Pr5-49
13	Heatsink Over-Heat pre–warning setting (oH2)	Pr5-47
14	PG Type and direction setting for PID and frequency command	Pr9-01
15	PG Feedback compensation limit	Pr9-09

Modified functions on Firmware version 2.xx

Parameter	Firmware version 2.xx	Firmware version 1.xx
Pr0-02	Depress the PROG key and hold 3 seconds to complete Parameter reset (Firmware version ≥ 2.04)	Depress the PROG key to complete Parameter reset (Firmware version ≤ 2.03)
Pr2-10	Digital Input terminals status select—By Hexadecimal numbers	Digital Input terminals status select—By Decimal numbers
Pr4-32	The PLC Run or MSS Run Operation Direction—By Hexadecimal numbers	The PLC Run or MSS Run Operation Direction—By Decimal numbers
Pr5-02	Slip Compensation of Motor set in RPM	Slip Compensation of Motor set in %

Copyright statement

All information in this manual is POLYSPEDE'S intellectual property. Even though we have done our best to make this manual error free we are unable to guarantee 100% correctness.

Therefore we reserve the right to change the information in this manual without prior notice.
But we will provide the latest edition document on our website, for free download.

http://www.polyspede.com

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Getting Started

This manual will be helpful in the installation, parameter setting, troubleshooting, and daily maintenance of the drives. To guarantee safe operation of the equipment, read the following safety guidelines before connecting power to the drive. Keep this operating manual handy and distribute to all users for reference.

WARNING

Always read this manual thoroughly before using SPEDESTAR PC1 Series Drive.

CAUTION! ***Do not connect outputs to electronic circuits***, Drive is designed for 3Ø induction motors only. Connecting in this fashion will **VOID the WARRANTY**.

DANGER! AC input power must be disconnected before any maintenance. Do not connect or disconnect wires and connectors while power is applied to the circuit. Qualified technicians must perform maintenance.

CAUTION! There are highly sensitive MOS components on the printed circuit boards. These components are especially sensitive to static electricity. To avoid damage to these components, do not touch these components or the circuit boards with metal objects or your bare hands.

DANGER! A charge may still remain in the DC-link capacitor with voltages even if the power has been turned off. To avoid personal injury, please ensure that power has turned off before operating Drive and wait ten minutes for capacitors to discharge to safe voltage levels.

CAUTION! Ground the Spedestar PC1 using the ground terminal. The grounding method must comply with the laws of the country where the Drive is to be installed. Refer to Basic Wiring Diagram.

DANGER! The Drive may be destroyed beyond repair if incorrect cables are connected to the input/output terminals. Never connect the Drive output terminals U/T1, V/T2, and W/T3 directly to the AC main circuit power supply.

CAUTION! The final enclosures of the Drive must comply with EN50178. (Live parts shall be arranged in enclosures or located behind barriers that meet at least the requirements of the Protective Type IP20. The top surface of the enclosures or barrier that is easily accessible shall meet at least the requirements of the Protective Type IP40). (Spedestar PC1 Series corresponds with this regulation.)

CAUTION! Heat sink may heat up over 70°C (158°F), during the operation. Do not touch the heat sink.

CAUTION! The rated voltage for the drive must be ≤ 240V (≤ 480V for 460V models, ≤ 600V For 575V models) and the mains supply current capacity must be ≤ 5000A RMS (≤10000A RMS for the ≥ 40hp (30kW) models).

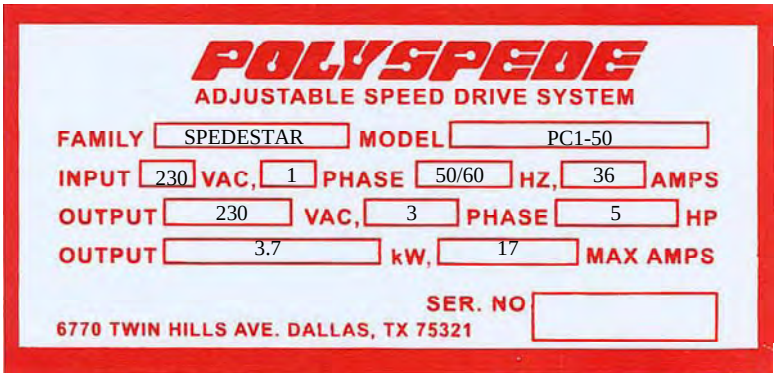
CAUTION! The leakage current between chassis and earth could be up to 22mA.

CAUTION! The load motor should meet IEC:60034-1 standard.

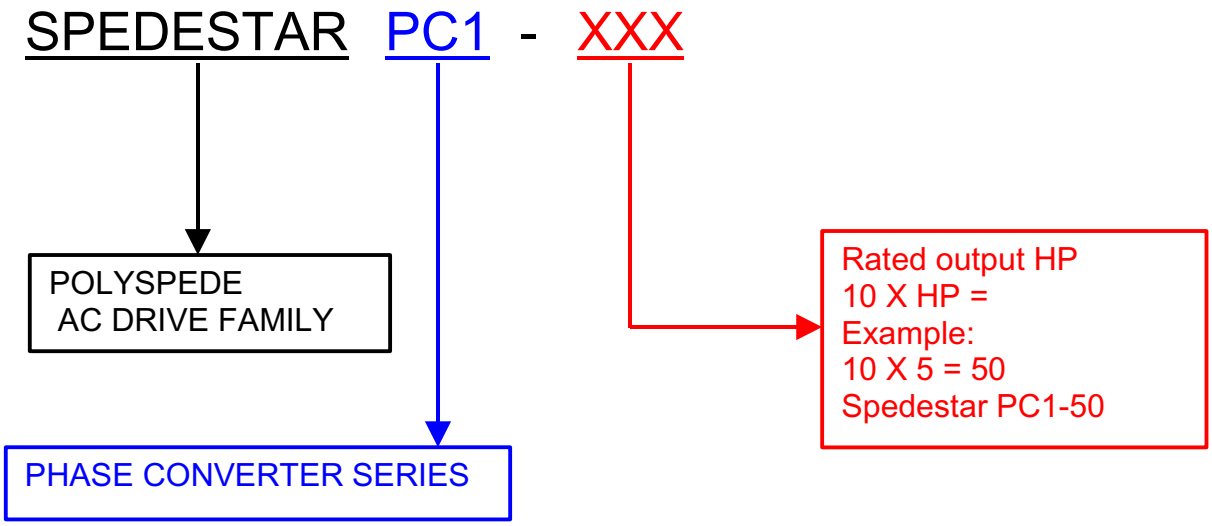
CHAPTER 1 RECEIVING AND INSPECTION

1-1 Nameplate Information

Example for PC1 series, 5HP/3.7kW 230V 1-Phase Input



1-2 Model Explanation



- Please contact Polyspede immediately should any discrepancy occur.

CHAPTER 2 STORAGE AND INSTALLATION

2-1 Storage

The Drive should be kept in the shipping carton before installation. In order to retain the warranty coverage, the Drive should be stored properly when it is not to be used for an extended period of time.

Ambient Conditions:

Operation: Air Temperature: -10°C to +40°C (14°F to 104°F)
Atmosphere pressure: 86 to 106 kPa
Installation Site Altitude: below 1000m
Vibration: Maximum 9.80 m/s2 (1G) at less than 20Hz
Maximum 5.88 m/s2 (0.6G) at 20Hz to 50Hz

Storage: Temperature: -20°C to +60°C (-4°F to 149°F)
Relative Humidity: Less than 90%, no condensation allowed
Atmosphere pressure: 86 to 106 kPa

Transportation: Temperature -20°C to +60°C (-4°F to 140°F)
Relative Humidity: Less than 90%, no condensation allowed
Atmosphere pressure: 86 to 106 kPa
Vibration: Maximum 9.80 m/s2 (1G) at less than 20Hz, Maximum 5.88m/s2 (0.6G) at 20Hz to 50Hz

Pollution Degree 2: good for a factory type environment.

2-2 Installation

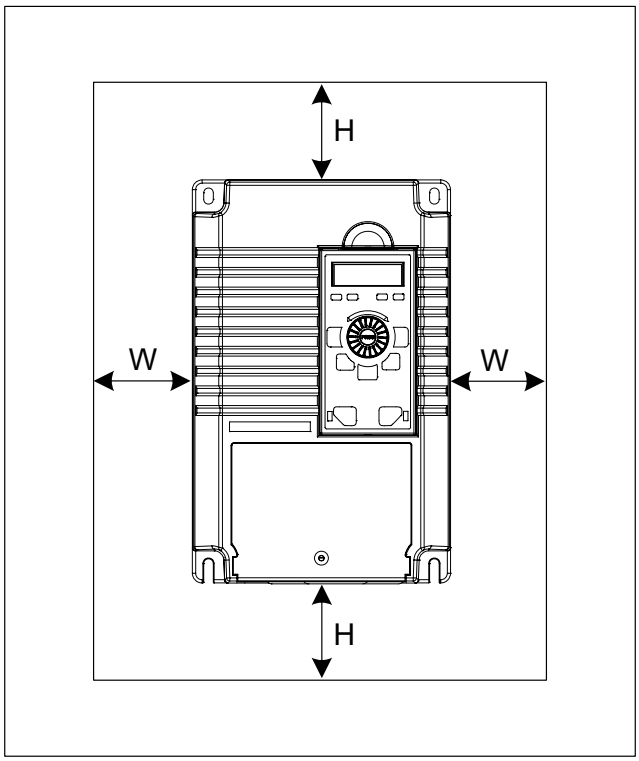
CAUTION

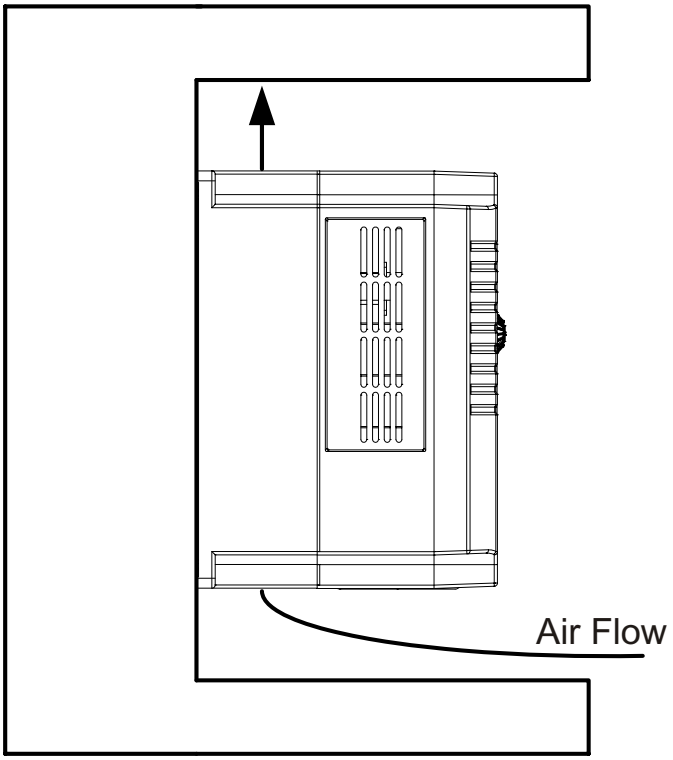
The control, power supply and motor leads must be laid separately. They must not be fed through the same cable conduit / trenching.
High voltage insulation test equipment must not be used on cables connected to the drive.

Improper installation of the Drive will greatly reduce its life. Be sure to observe the following precautions when selecting a mounting location.

Failure to observe these precautions may void the warranty!

The Drive generates heat. Allow sufficient space around the unit for heat dissipation.
Mount the Drive vertically and do not restrict the airflow to the heat sink fins.





Frame Code	W (min) mm(inch)	H (min) mm(inch)	Air flow CMH (m3/hr)
B	75 (3)	175 (7)	160
C	75 (3)	200 (8)	350
D	100 (4)	300 (12)	650

2-3 Installation Environments

▲ Do not install the Drive in a place subjected to high humidity, steam, and dusty areas.
▲ Do not install the Drive in a place subjected to corrosive gases or liquids.
▲ Do not install the Drive in a place subjected to airborne dust or metallic particles.
▲ Do not install the Drive in a place subjected to excessive vibration.
▲ Do not mount the Drive near heat-radiating elements
▲ Do not install the Drive in a place subjected to temperature exceeding: -10° to +40°
(14°F to 104°F)

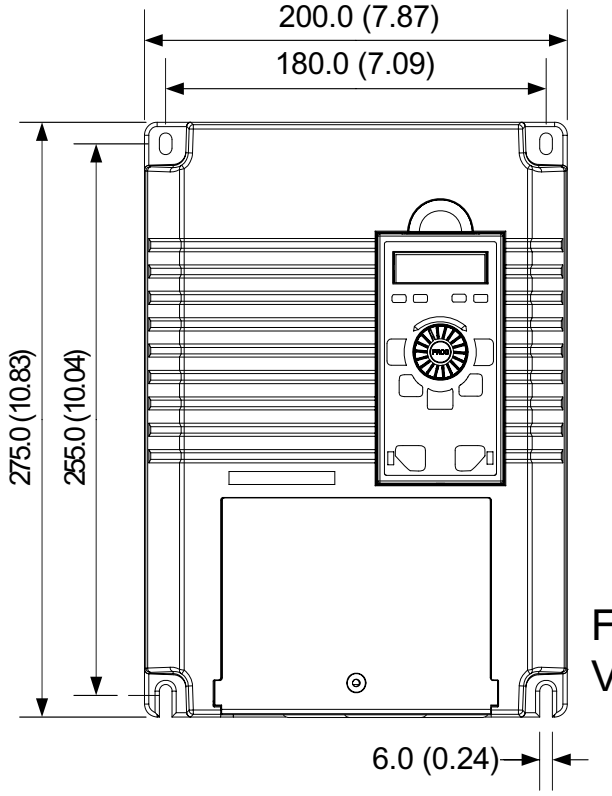
2-4 Dimensions

2-4-1 Frame B --(wall-mounted strengthened plastic enclosure):

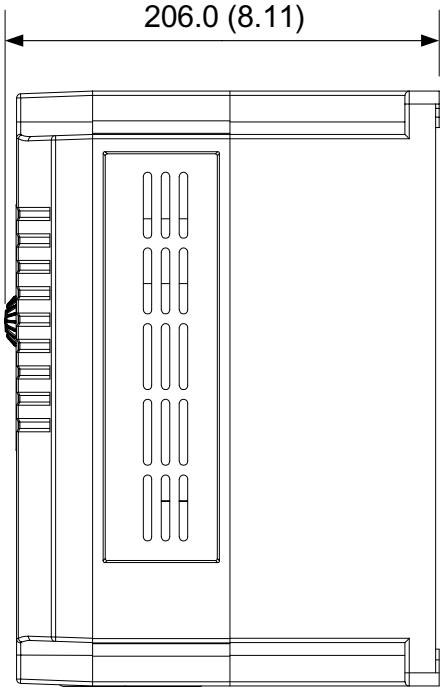
IP20/NEMA 1 (PC1-B)

Capacity / Power	230V 3 Phase
kW/Hp	PC1
3.7/5	B

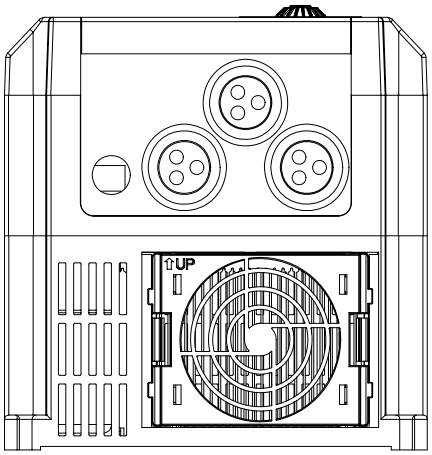
Unit:mm(inch)



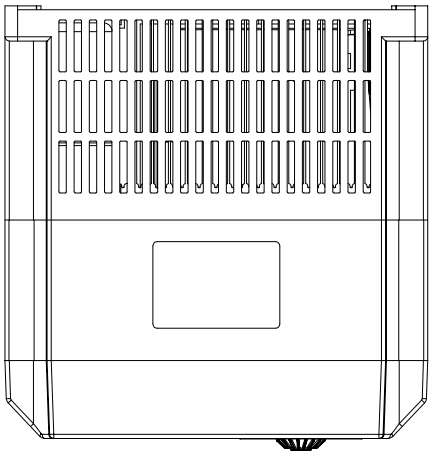
Front View



Side View



Bottom View



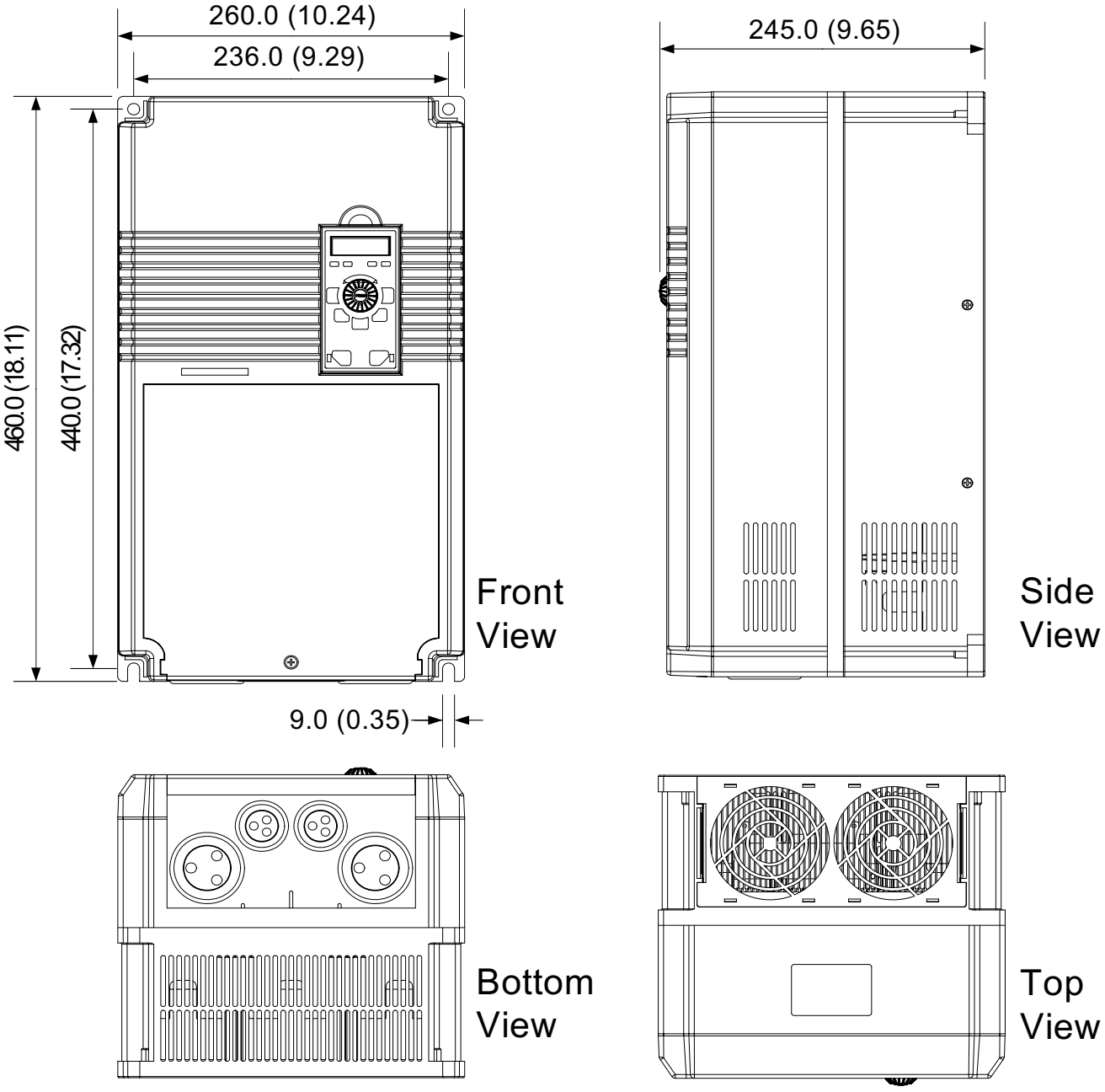
Top View

2-4-2 Frame C --(wall-mounted strengthened plastic enclosure):

IP20/NEMA 1, (PC1-C)

Capacity / Power	230V 1 Phase
kW/Hp	PC1
5.5/7.5	C
7.5/10	
11/15	

Unit:mm(inch)

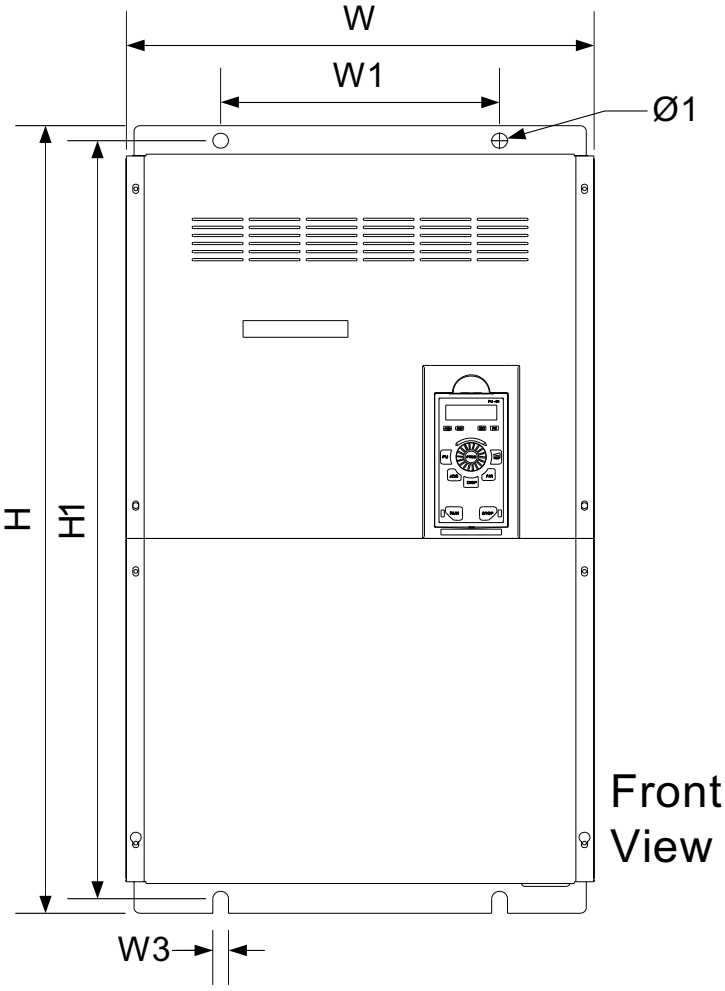


2-4-3 Frame D --(wall-mounted galvanized steel with baking varnish shell):
IP00/NEMA 0, (IP20/IP21 NEMA 1 optional)
(PC1-D)

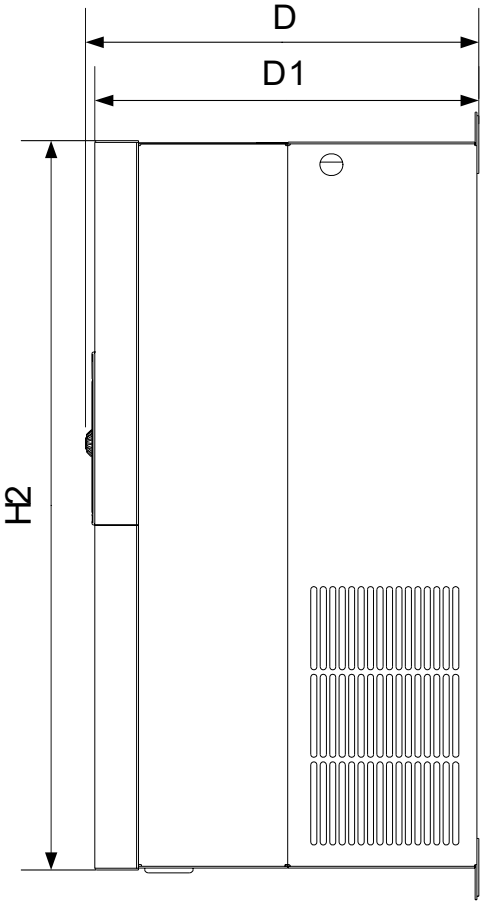
Power / Capacity	230V 1 Phase
kW/Hp	PC1
15/20	D
18/25	
22/30	

Unit: mm (inch)

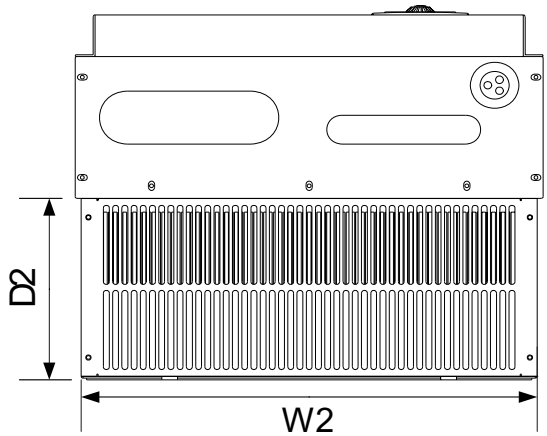
Frame	W	H	D	W1	W2	W3	H1	H2	D1	D2	Φ1
D	386.0 (15.20)	617.0 (24.29)	298.3 (11.74)	230.0 (9.06)	376.0 (14.80)	13.0 (0.51)	591.5 (23.29)	566.5 (22.30)	290.5 (11.44)	131.5 (5.18)	13 (0.51)



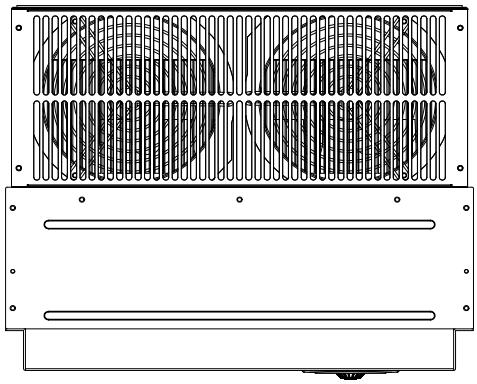
Front View



Side View



Bottom View

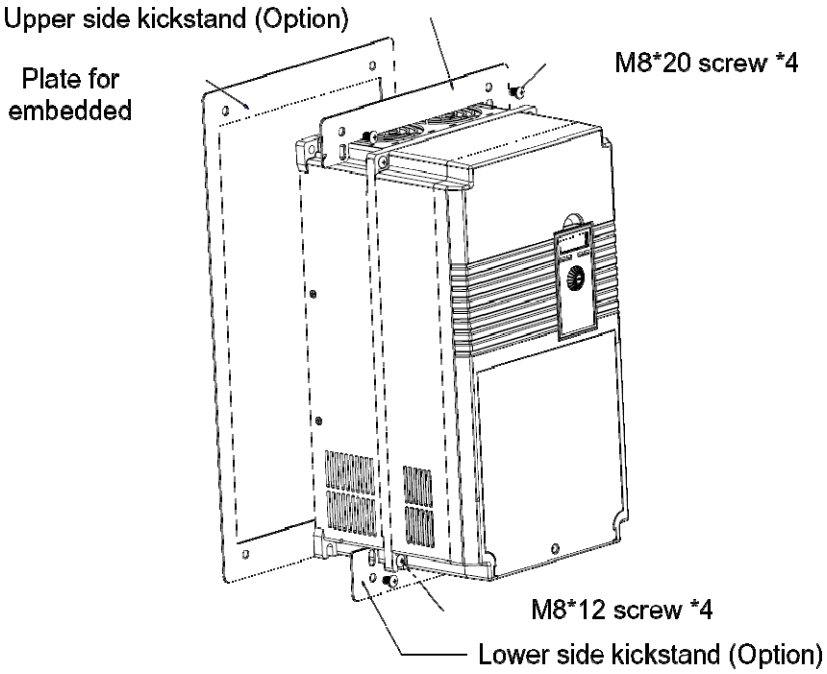


Top View

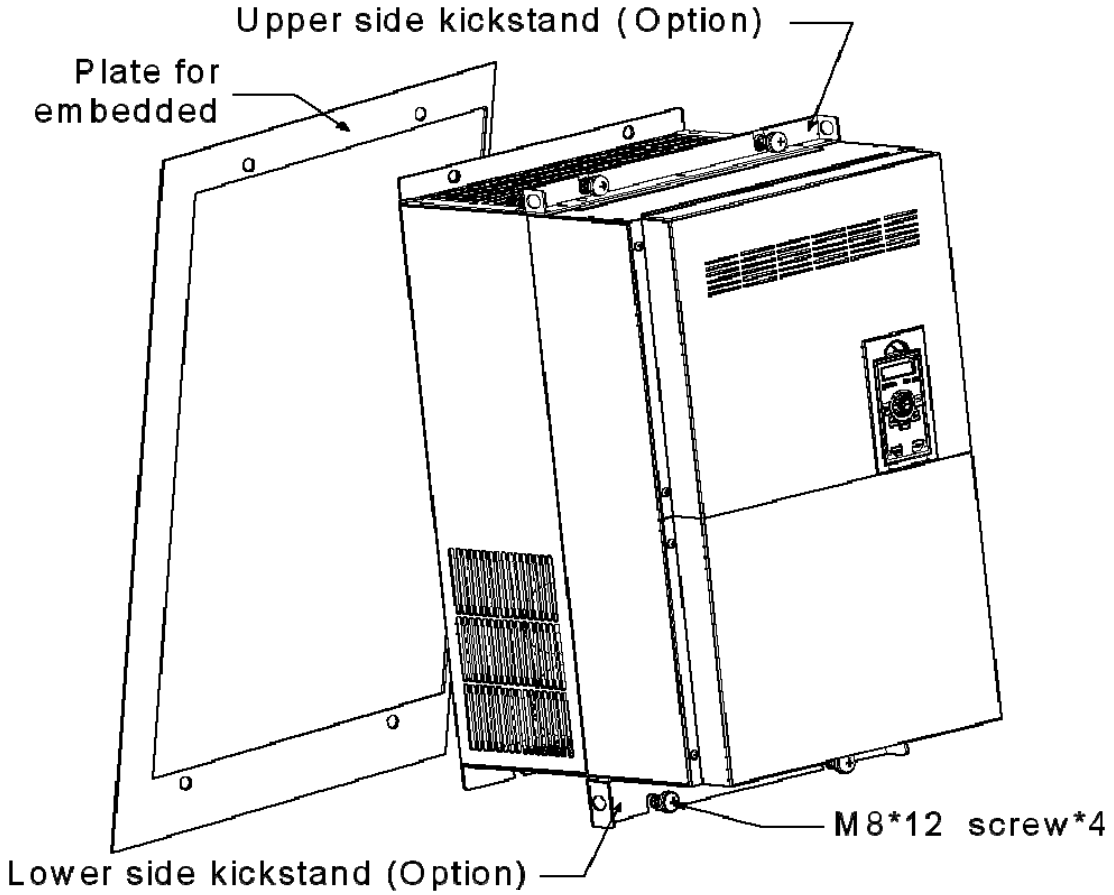
2-5 Embedded Installation (To isolate the ventilation system from panel)

Embedded Installation can isolate the ventilation system from the panel, the hot air is isolated thus a smaller size or totally enclosed panel can be used. It is easy to accomplish this by making a square cut and installing 2 kickstands. (Refer to 2-5-1 ~ 2-5-3).
In the Spedestar PC1 Series, frame code C and above were designed with the option of embedded installation.

2-5-1 Frame C:

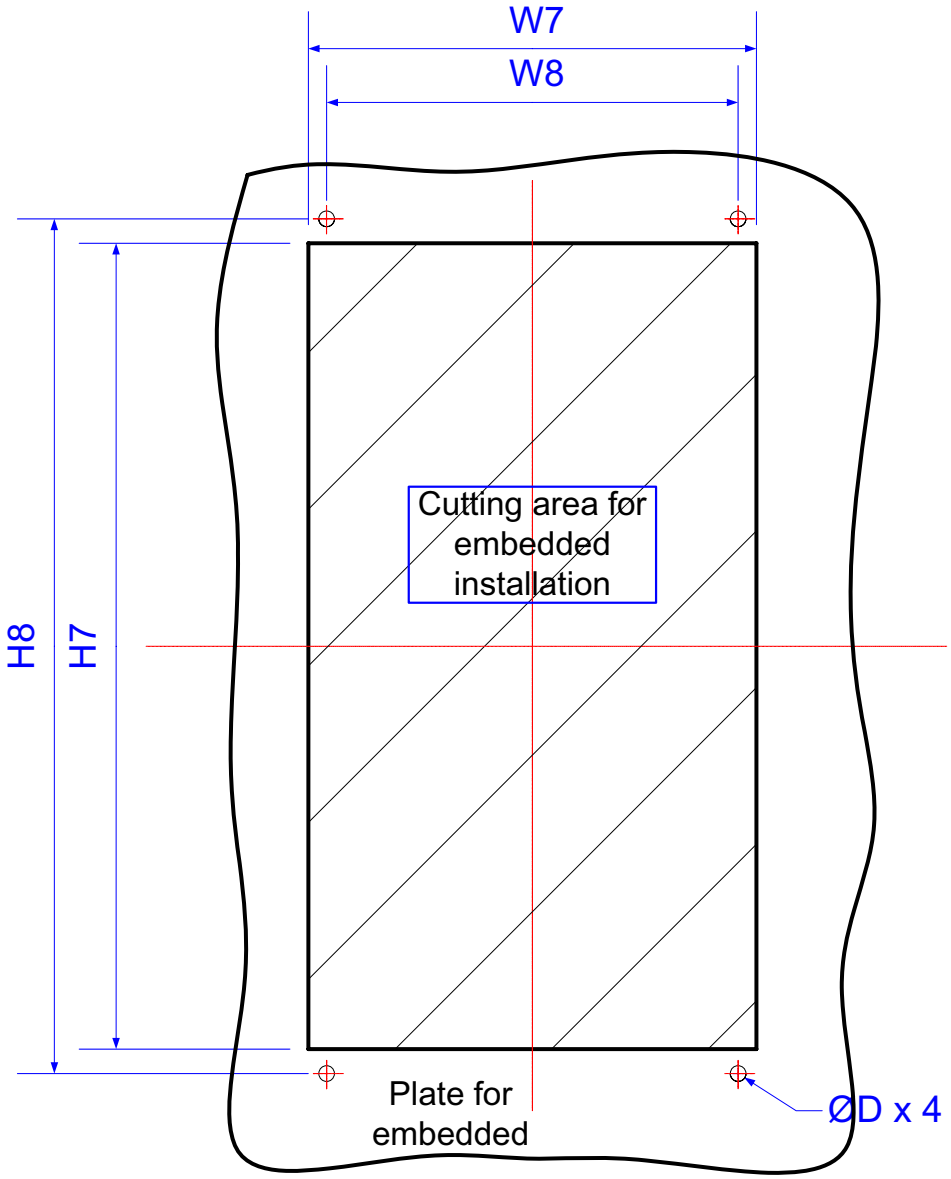


2-5-2 Frame D :



2-5-3 Cutting dimension and Accessories for embedded installation

Make a square cut according to below drawing.



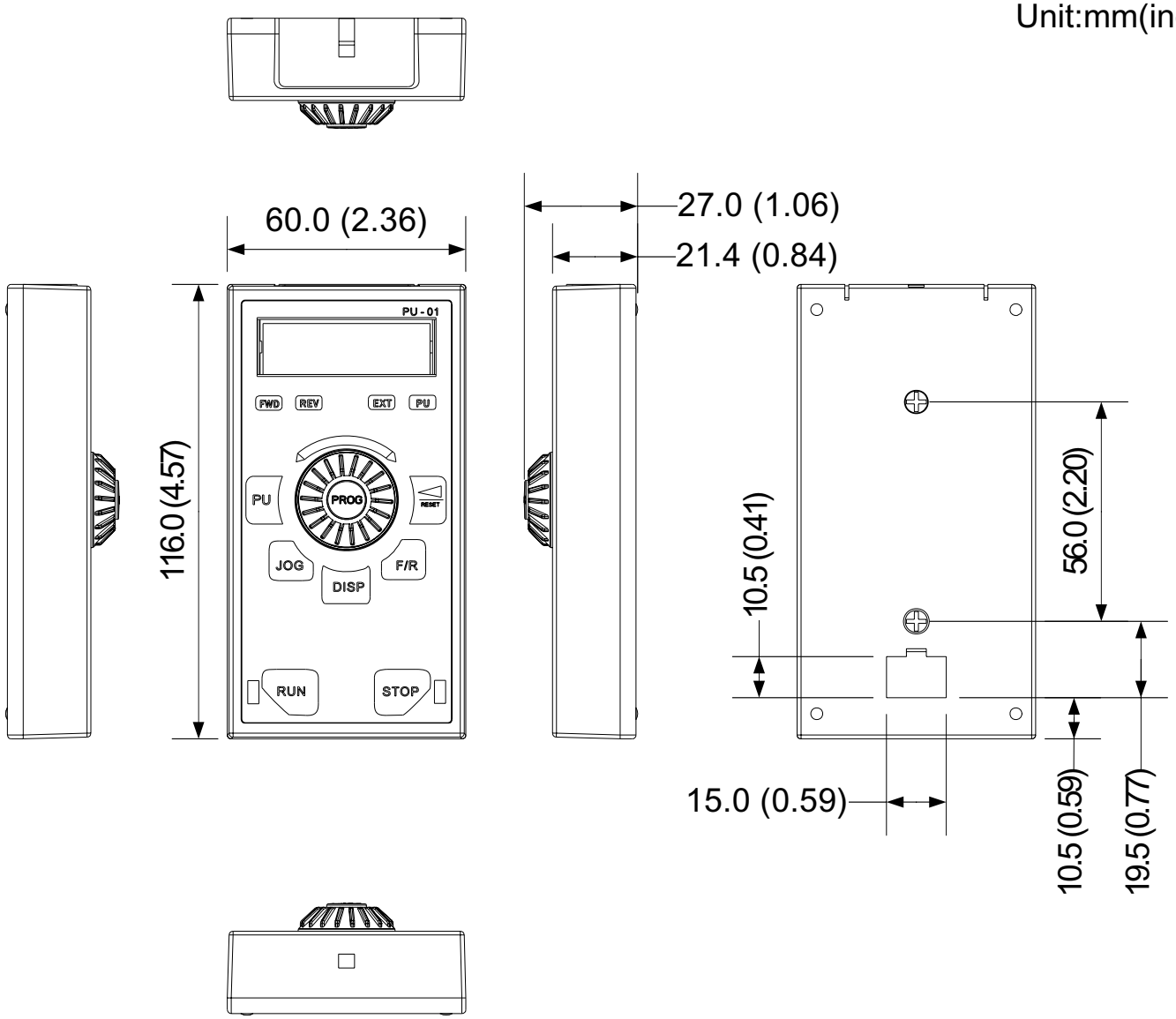
Dimension Unit: mm (inch)

Frame	Upper side kickstand (Option)	Lower side kickstand (Option)	W7	H7	W8	H8	ΦD
PC1-C	PEC-C-22	PEC-C-22	257 (10.19)	462 (18.19)	236 (9.29)	490 (19.29)	4 x Φ9.0 (0.35)
PC1-D	PEC-D-33	PEC-D-32	379.0 (14.91)	593.2 (23.35)	230.0 (9.05)	621.2 (24.44)	4 x Φ13.0 (0.51)

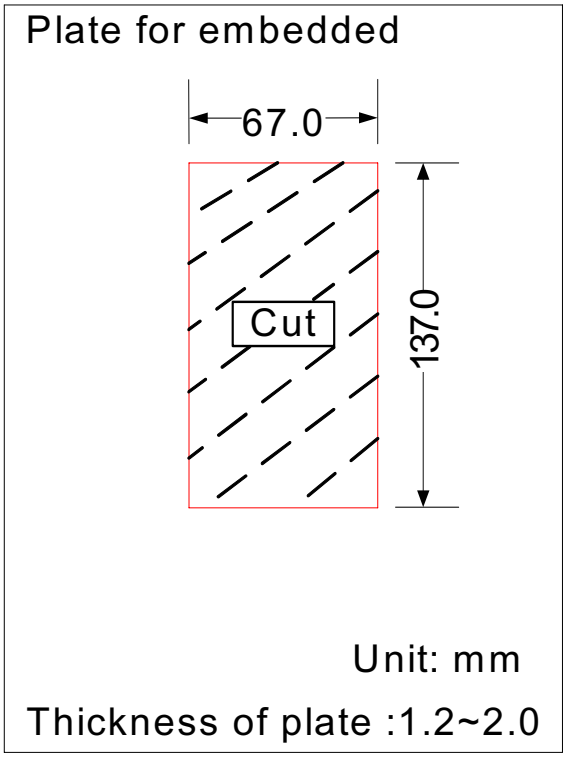
2-6 Digital Programming Keypad

2-6-1 Dimensions of PU-01 and PU-02

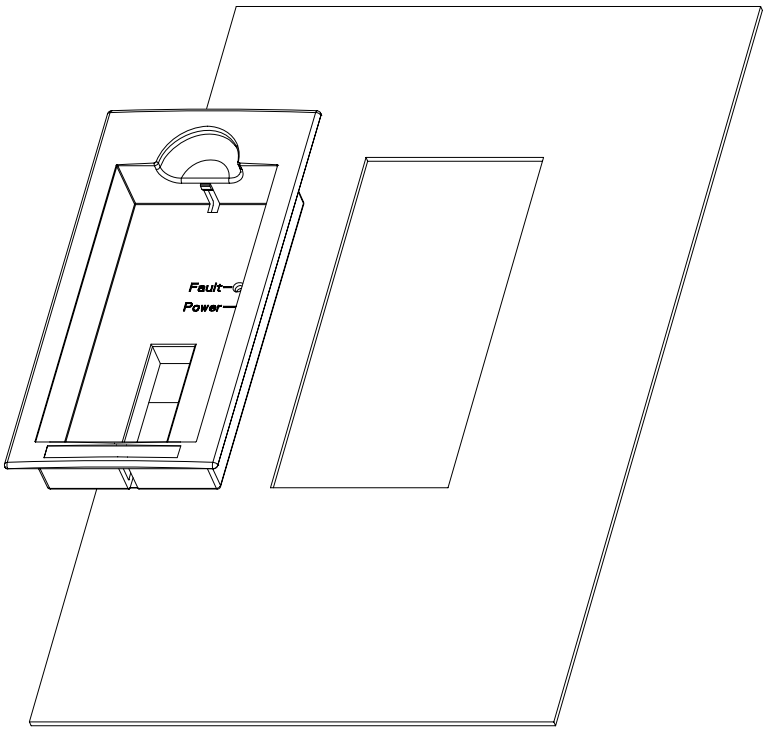
Unit:mm(inch)



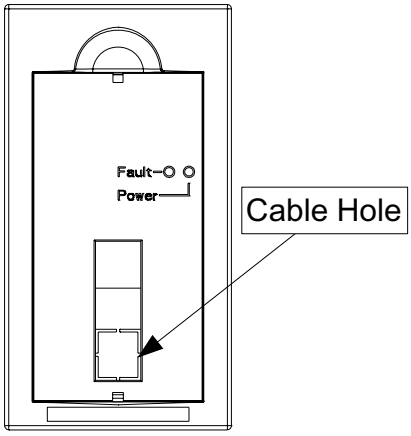
2-6-2 Installation of remote control



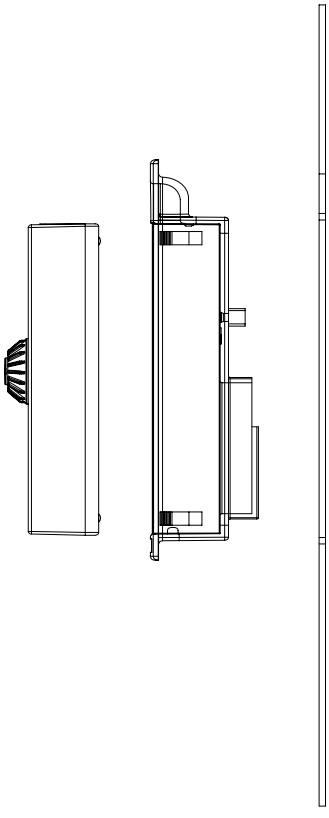
1. According to above dimension, make a square cutting.



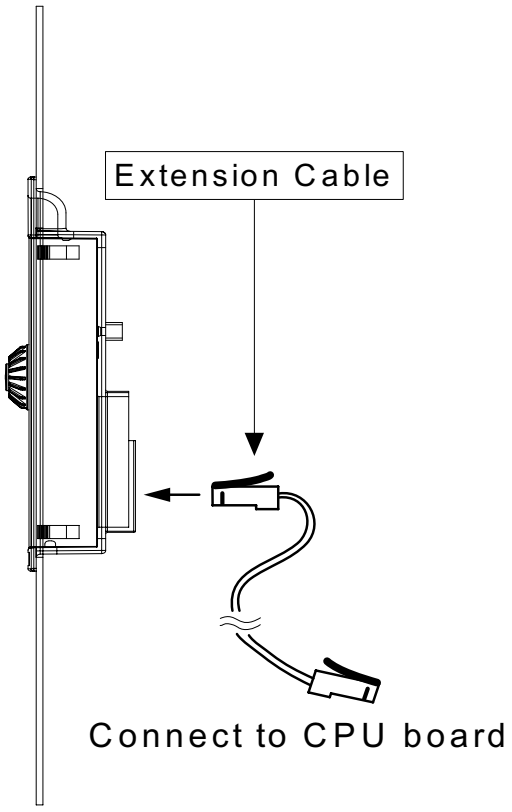
2. Insert the adapter (PR-01)



3. Remove the cable hole on the backside of adapter.



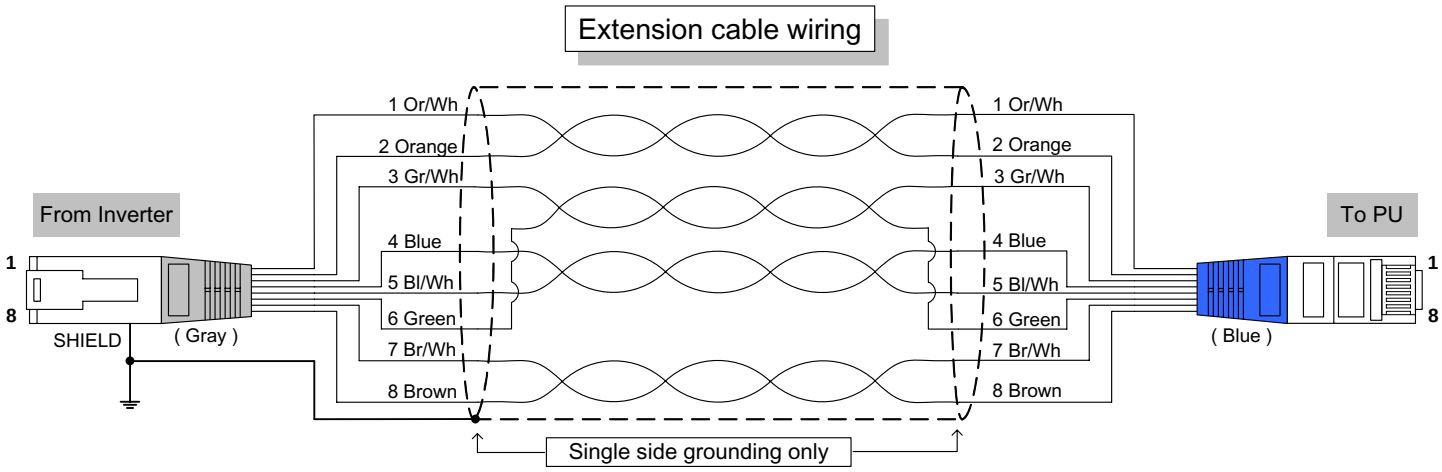
4. Insert the keypad to adapter.



5. Connect the extension cable

2-6-3 Extension cable for Keypad:

The extension cable is the RJ-45 8P8C twisted-pair shielded cable, commonly used in Ethernet. If you need a longer cable, you may make the cable yourself. The maximum extension length is 150 meters.
For this, you need 2 extra RJ-45 connectors. The pin assignment of the two connectors is below:



2-6-4: Extension cable specifications

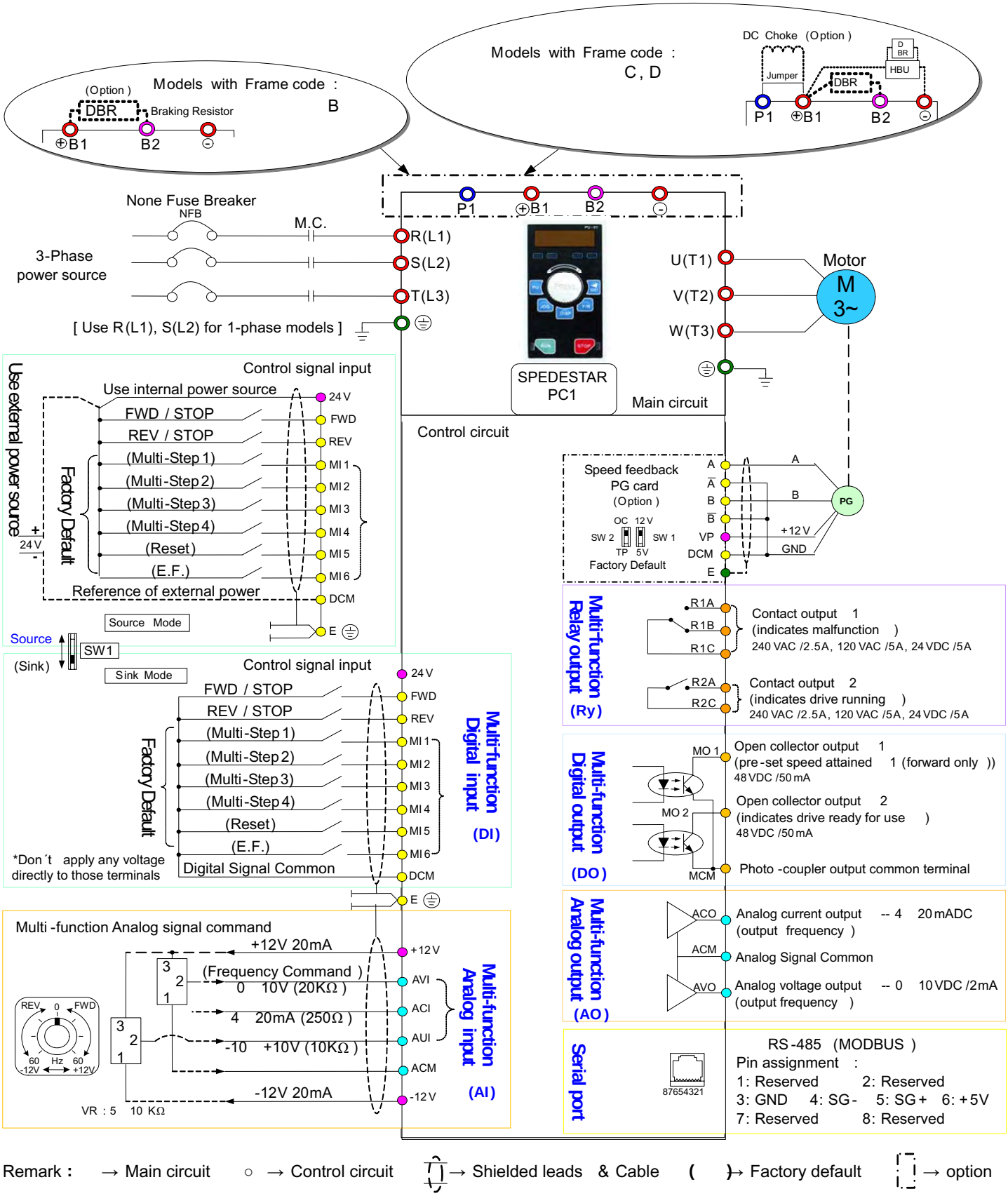
You may purchase the below standard lengths of cables from the dealers.

Specification	Ordering Number
8P8C, twisted and shield, 1M	PC1-001S
8P8C, twisted and shield, 2M	PC1-002S
8P8C, twisted and shield, 3M	PC1-003S
8P8C, twisted and shield, 5M	PC1-005S
8P8C, twisted and shield, 10M	PC1-010S
8P8C, twisted and shield, 15M	PC1-015S
8P8C, twisted and shield, 20M	PC1-020S
8P8C, twisted and shield, XXXM	PC1-XXXS (Contact Polyspede for other lengths)

CHAPTER 3 WIRING

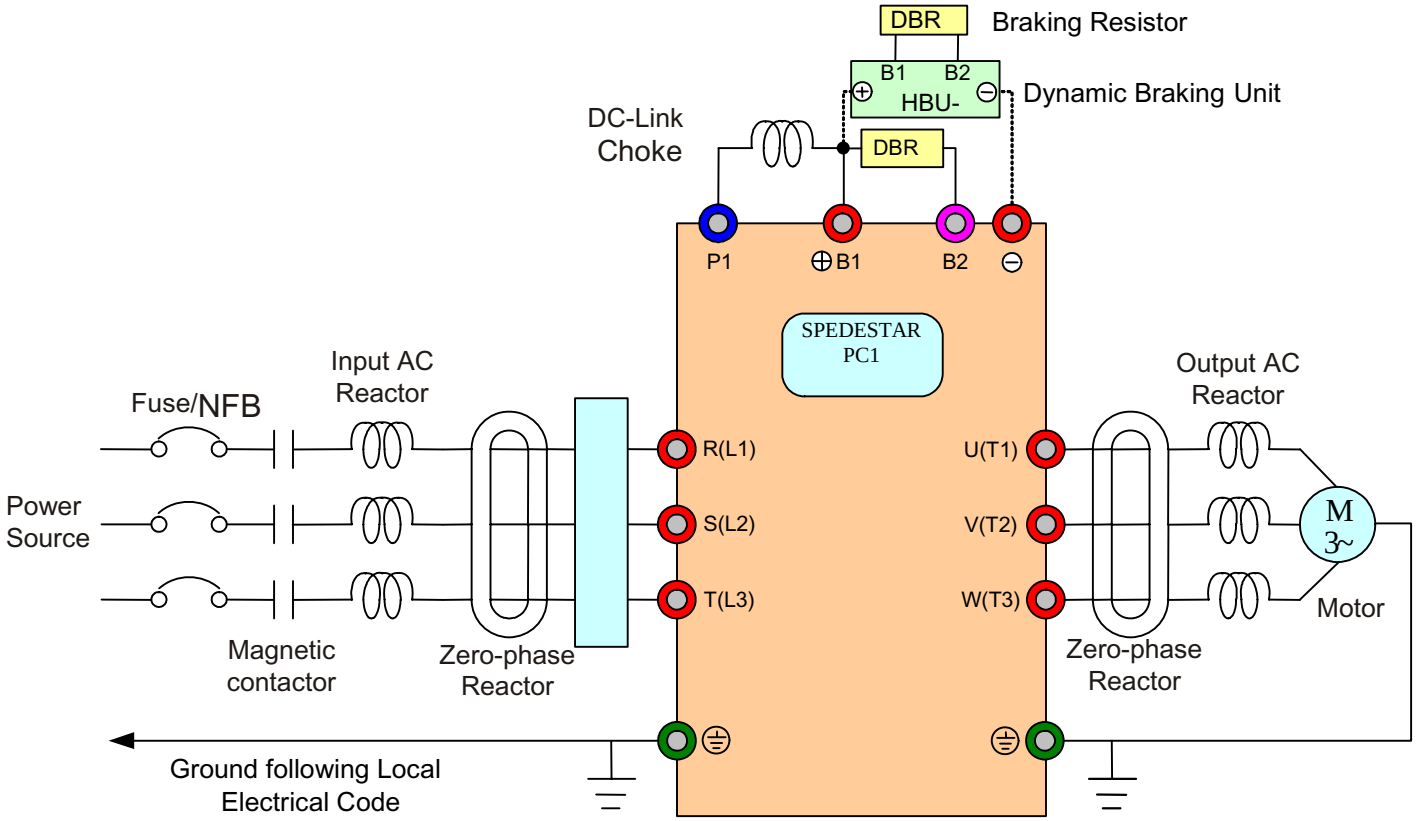
3-1 Basic Wiring Diagram

For wiring of the drive, it is divided into the main circuit and the control circuit. Users could open the case cover, and could inspect the main circuit terminal and the control circuit terminal; users connect the circuit in compliance with the following wiring method.
The following diagram is the standard wiring diagram for the SPEDESTAR PC1 series drive.



Remark : → Main circuit ○ → Control circuit → Shielded leads & Cable ( )→ Factory default → option

3-2 Wiring Diagram of Optional Peripheral devices



Items	**Explanations** (Refer to 3-2-1 to select proper Peripheral devices)
Power source	◆ Please follow the specific power supply requirements shown in Chapter 8
Fuse/NFB/ELCB	◆ There might be an inrush current during power up. Please check the chart of 3-2-1 and select the correct NFB or fuse with rated current. Please do not use NFB as a Run/Stop switch ◆ If the electric-leakage circuit breaker is installed in the drive, please select the sensing current above 200ma with the action time of more than 0.1 second to have these actions accessible.
Magnetic contactor (MC)	◆ Please do not use a Magnetic contactor as the Run/Stop switch of the drive, as it will reduce the operating life cycle of the drive.
Input AC Reactor (HRL-xxxxx)	◆ Used to improve the input power factor, to reduce harmonics and provide protection from AC line disturbances.(surges, switching spikes, short interruptions, etc.) ◆ AC line reactor should be installed when the power supply capacity is 500kVA or more and exceeds 6 times the inverter capacity, or the mains wiring distance less than 10m. ◆ To reduce electromagnetic interference or noise on the input side of the drive.
Zero-phase Reactor (FC-H-xxxxx)	◆ Zero phase reactors are used to reduce radio noise especially when audio equipment is installed near the drive. Effective for noise reduction on both the input and output sides. Attenuation quality is good for a wide range from AM band to 10MHz.

DC-Link Choke (HDC-xxx) (Frame C and above only)	◆ To reduce the ripple current, reducing harmonics and increase the power factor. ◆ To protect the smoothing capacitor
Dynamic Braking Unit (HBU-xxxx)	◆ Used to reduce the deceleration time of the motor when drive's Braking Chopper is not built-in.
Braking Resistor (DBR-xxxxx)	◆ To absorb the motor regeneration energy when the motor stops by deceleration.
Output AC Reactor (HRL-xxxxx)	◆ To reduce dv/dt and motor terminal peak voltage in long motor lead applications. ◆ For applications with long motor cable 20 to 250 meter, it is necessary to install a reactor at the inverter output side.
Motor	◆ Please select proper motor according to chapter 8

3-2-1 Wiring specifications and Selection of Optional Peripheral devices

1. In order to keep the voltage drop within 2%, please follow the specified cable size
2. For 1-phase drives, the current rating of the breaker shall be 2 times maximum input current rating.

AC source: 1 phase 230V class	Wiring specifications				Optional Peripheral devices				
	Terminal Screws	Wire type and size			NFB ELCB	Magnetic contactor (MC)	Input AC Reactor	DC-Link Choke	Output AC Reactor
		HIV cable mm/ (AWG/MCM)							
Series/model	Main Circuit (Grounding circuit)	Main Circuit	Grounding Circuit	Control circuit	Capacity (A)	Capacity (A)	HRLxxxx	HDCxxxx	HRLxxxx
Spedestar									
PC1-50	M4 (M4)	14 (6)	5.5 (10)	0.75(18)	45	45	110L	110H	050L
PC1-75	M6 (M4)				60	60	115L	115H	075L
PC1-100		22 (4)	14 (6)		70	70	120L	120H	110L
PC1-150		38 (2)			100	100	130L	130H	115L
PC1-200	M12 (M5)	60 (1/0)	38 (2)		150	150	140L	140H	120L
PC1-250		80 (3/0)			175	175	150L	150H	130L
PC1-300		100 (4/0)			200	200	160L	160H	

3-3 Main Circuit Terminal Explanations

Terminal Symbol	Content Explanation
R (L1), S (L2)	AC line input terminals
U (T1), V (T2), W (T3)	Drive output terminals motor connections
⊕/B1, B2	Connections for Braking Resistor (optional) Refer to Chapter 9 (the selection chart)
⊕/B1, Θ	Connecting terminals of the external Dynamic Brake Unit. (DC Bus, power source terminals)
P1, ⊕/B1	Connections for Power-improved DC Link Reactor. (Optional) Disconnect the short-circuit piece when the device is installed
⏚	Ground terminals, please have these terminals grounded following the third-type grounding of 230V series within the electrician regulations

3-4 Control Terminal Explanations

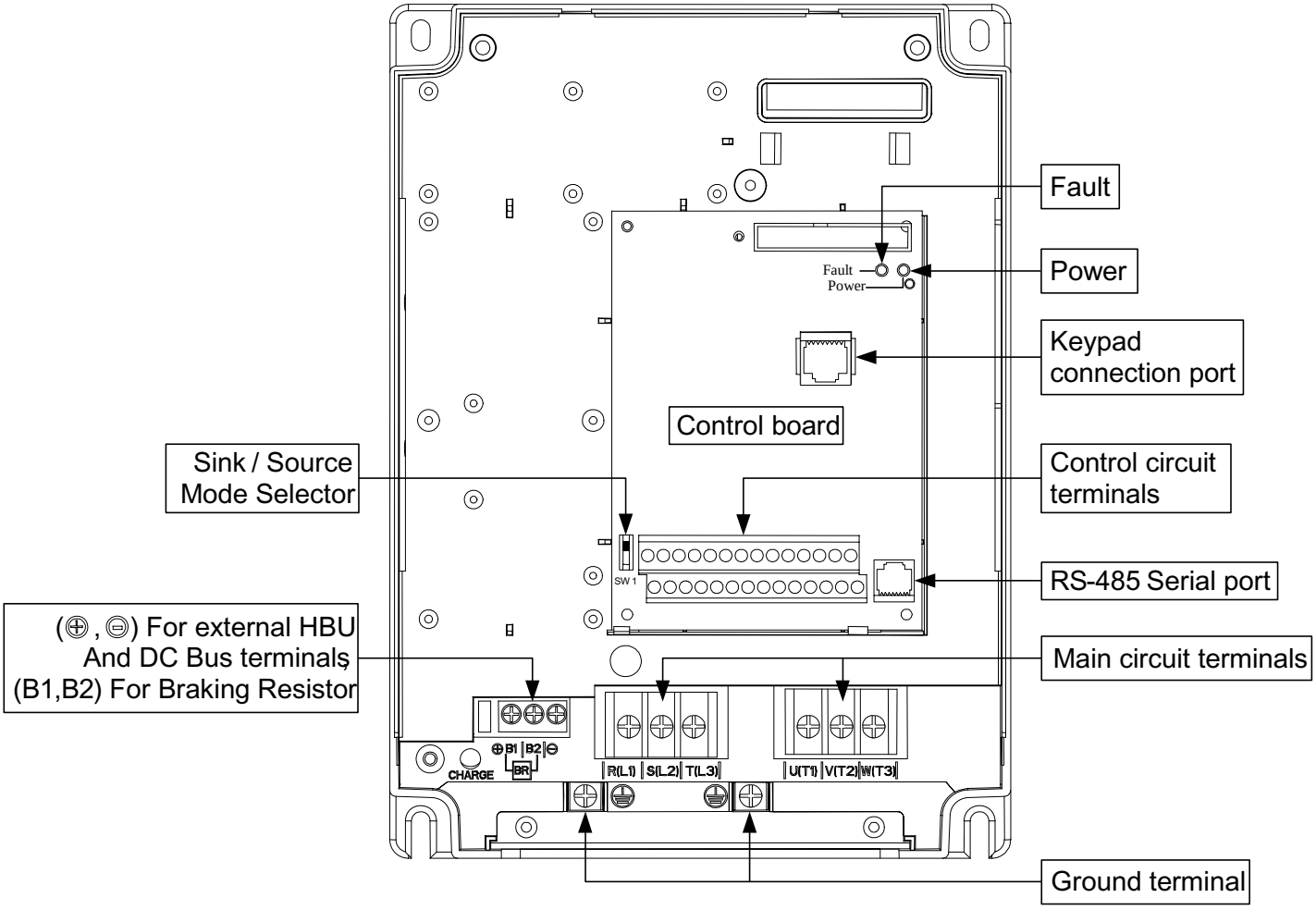
Terminal Symbols	Explanation on the Terminal Function	Factory Default
MI1	Multi-function input selection 1 (3-wire STOP-designated terminal)	Multi-step speed command 1
MI2	Multi-function input selection 2	Multi-step speed command 2
MI3	Multi-function input selection 3	Multi-step speed command 3
MI4	Multi-function input selection 4	Multi-step speed command 4
MI5	Multi-function input selection 5	Abnormal reset command
MI6	Multi-function input selection 6 (TRG-designated terminal)	EF input
AVO	Multi-function analog voltage output (0~10VDC, 2mA)	Output frequency
ACO	Multi-function analog current output (4~20mADC)	Output frequency
R1A	Multi-function relay 1 output contact (NO / a)	Resistive Load 5A(N.O.)/3A(N.C.) 240VAC 5A(N.O.)/3A(N.C.) 24VDC Inductive Load 1.5A(N.O.)/0.5A(N.C.) 240VAC 1.5A(N.O.)/0.5A(N.C.) 24VDC Refer to Pr2-19, Pr2-20
R1B	Multi-function relay 1 output contact (NC / b)	
R1C	Multi-function relay 1 output contact – Common end	
R2A	Multi-function relay 2 output contact (NO / a)	
R2C	Multi-function relay 2 output contact – Common end	
E	Shield terminal	
24V	Digital control source signal Reference point is DCM	+24V 50mA

FWD	FWD RUN-STOP command	
REV	REV RUN-STOP command	
DCM	Digital control signal - the common end	
+12V	Auxiliary reference power Reference point is ACM	+12V 20mA
-12V	Auxiliary reference power Reference point is ACM	-12V 20mA
ACM	Analog control signal - the common end	
AVI	Multi-Function analog voltage command	The maximum operation frequency corresponding to 0~+10V
ACI	Multi-Function analog current command	The maximum operation frequency corresponding to 4~20mA
AUI	Multi-Function auxiliary analog voltage command	The maximum operation frequency corresponding to -10~+10V
MO1	Multi-function output terminal 1 (photo coupler)	Pre-set speed attained (Max 48VDC 50mA)
MCM	Multi-function output terminal (photo coupler) – the common end	
MO2	Multi-function output terminal 2 (photo coupler)	Drive ready for use (Max 48VDC 50mA)

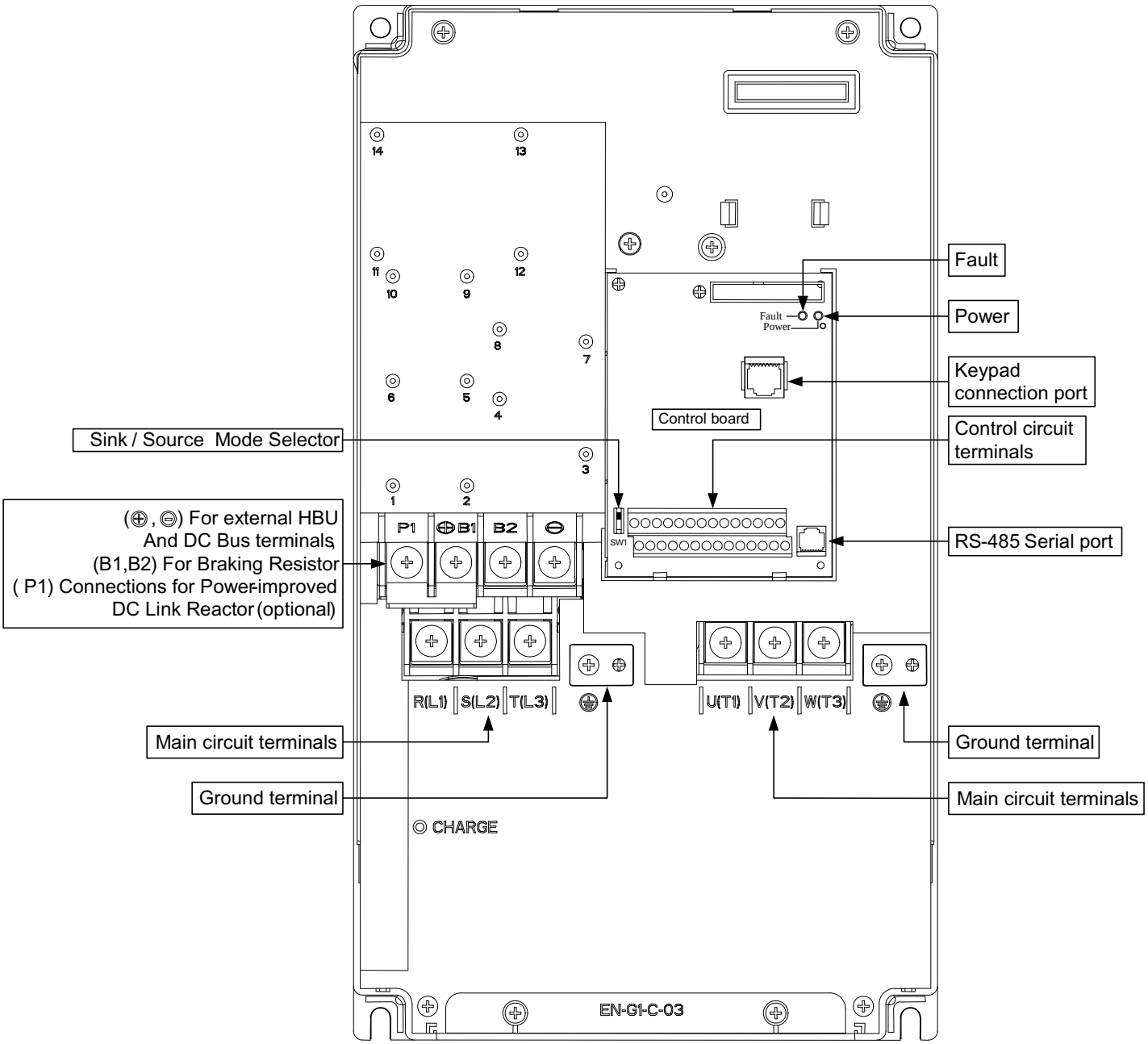
Control signal wiring size: 18 AWG (0.75 mm^2)
Analog control signal wire specification: 18 AWG (0.75 mm^2), covered with shield twisted net.

3-5 Component Explanations

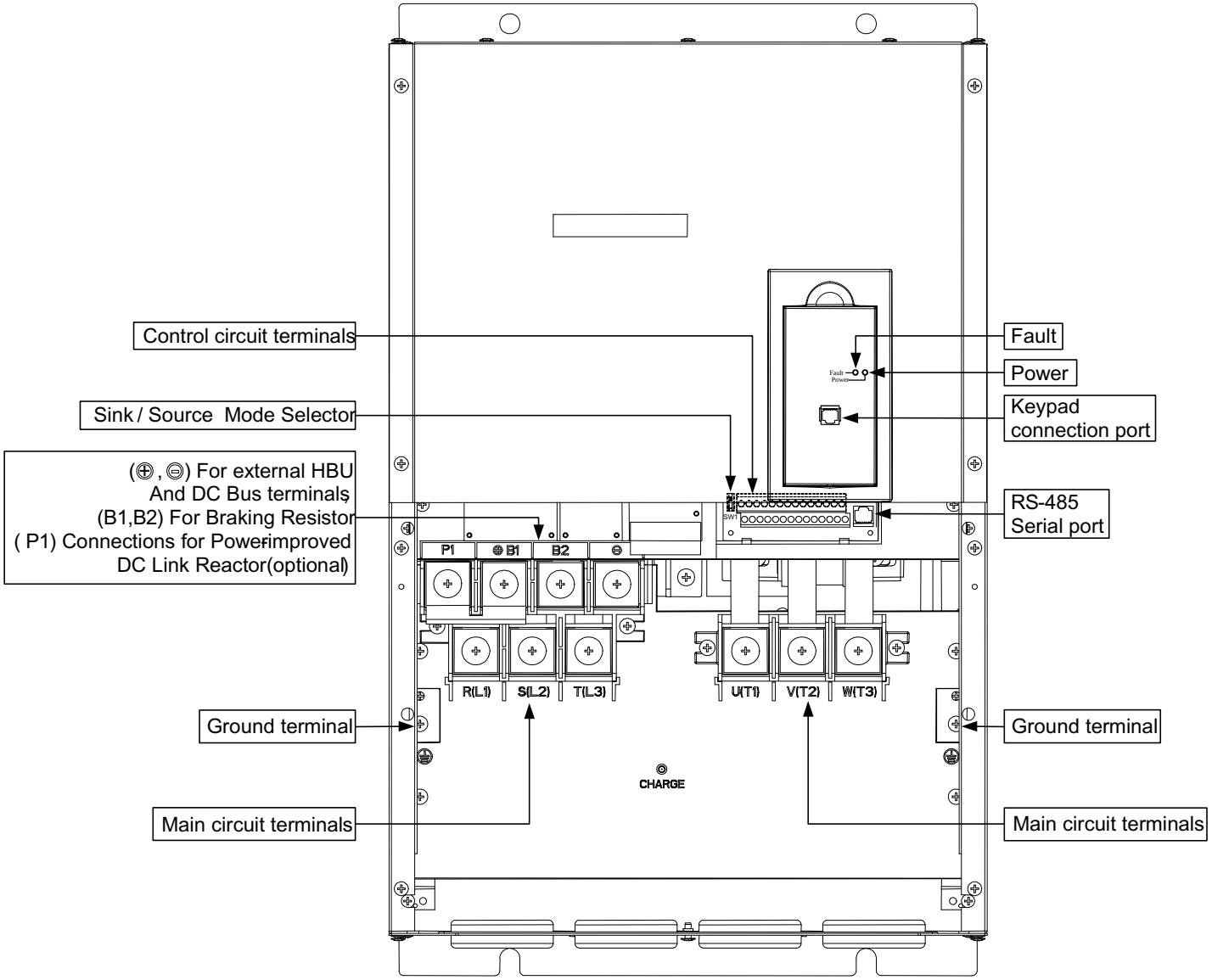
3-5-1 For frame code: B



3-5-2 For frame code: C



3-5-3 For frame code: D

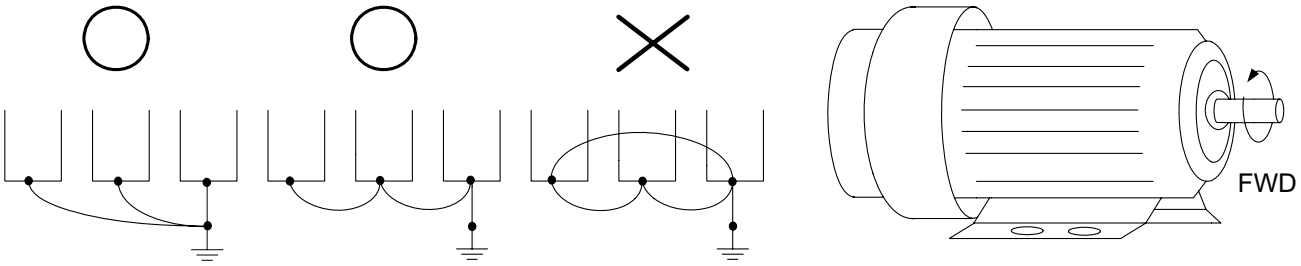


3-6 Wiring Notice:

PLEASE READ PRIOR TO INSTALLATION.

1. When the best wiring route is determined and settled, please conduct the wiring following the local electrical regulations & code.
2. The connection between the single-phase AC input power and the main circuit terminal R/L1, S/L2, has to set up a none-fusing switch in between. The optimal design is to series connect with an electro-magnetic contactor (MC), so as to cut off the power supply at the same time when the drive protection function acts.
   (The two ends of the electro-magnetic contactor should have the R-C Varistor).
3. There is no phase-order differentiation in the input power R/L1, S/L2 and users could connect with either one.

4. The ground terminal ⏚ is grounded with the third-type of grounding method (with the grounding impedance under 100Ω).
5. The grounding wire of the drive could not be grounded at the same time with machinery with grand current loading, like that of the electric soldering machine and of the motor with grand horsepower; they have to be grounded individually.
6. The shorter the ground wires, the better it is.
7. When several drives are grounded at the same time, be sure not to make it into a ground circuit. Please refer to the following diagram:

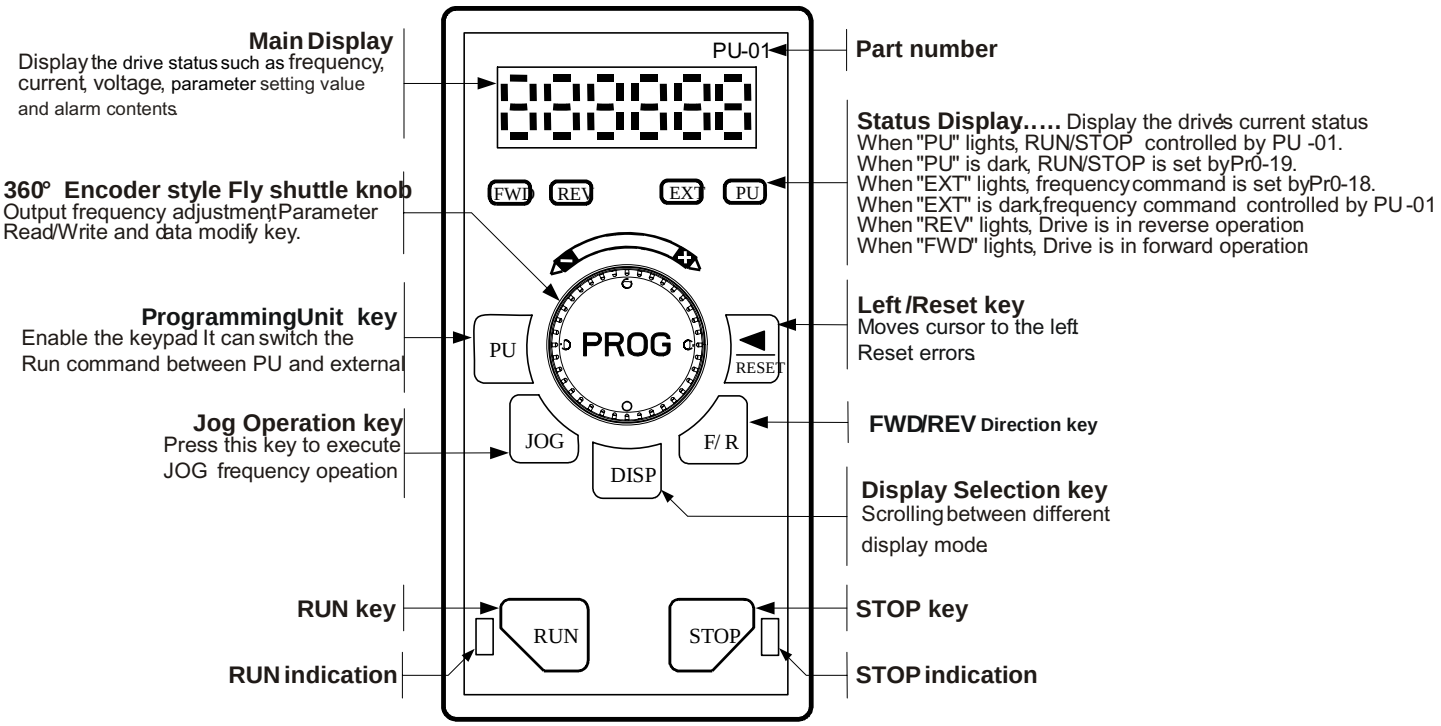


8. If the output terminals U/T1, V/T2 and W/T3 of the drive are connected relative to the U, V, and W terminals of the motor, the FWD indicator located on the digital control panel of the drive will be lit, and that means the drive is running forward, and the rotation direction of the motor will be shown as the right hand side diagram above; if the REV indicator is lit, it means that the drive is running in reverse direction, and the rotation direction will be of the opposite direction compared with the above diagram. If users are not sure of whether the connection between output terminals U/T1, V/T2 and W/T3 of the drive is of one-to-one connection with U, V, and W terminals of the motor, simply swap either two wires among the U, V, and W terminals of the motor for correction if the drive is running forward while the motor is running at reverse direction.
9. Ensure the voltage the maximum current supplied meets the drives requirements.
10. When the “Digital Programming Unit” is displayed, please do not disconnect or dissemble any wiring.
11. No braking resistor is installed within the SPEDESTAR series drive (optional item). Therefore, be sure to purchase and install a braking resistor (+ braking unit on frame C and above), if loading inertia is great or that frequent starting/stopping with fast decel times are used.
12. Be sure not to connect the AC power with the terminals U/T1, V/T2 and W/T3 of the drive.
13. Please tightly fasten the screws of the main circuit terminals so as to prevent sparks generated due to the vibration and loosening of the screws.
14. Wiring of the main circuit and of the control circuit should be separated so as to prevent erroneous actions. If the interlock connection is needed, please make it an intersection of 90°.
15. If terminals U/T1, V/T2 and W/T3 on the output side of the drive are in need of the noise wave-filter, it is then necessary to use the induction-type L-Varistor, but be sure not to add in the phase-carrying capacitor or the L-C- and R-C-type wave filters.
16. Please use the separating wire as much as possible during control wiring, and be sure not to expose the peeled-off separation net in front of the terminal to the external.
17. Please use the separating wire or tube as much as possible during power wiring, and ground these two ends of the separating layer or tube to Ground.
18. If the installation site of the drive is sensitive to interferences, please have the RFI filters installed, and the closer the drive to the installation site, the better. In addition, the lower the carrier frequency is, the less the interferences will be.
19. If the electric-leakage circuit breaker is installed in the drive, it could serve as the protection for the electric-leakage error, and as the prevention on the erroneous actions of the electric-leakage circuit breaker; please select the sensor current above 200ma with the action time of more than 0.1 second to have these actions accessible.

CHAPTER 4 DIGITAL KEYPAD OPERATION

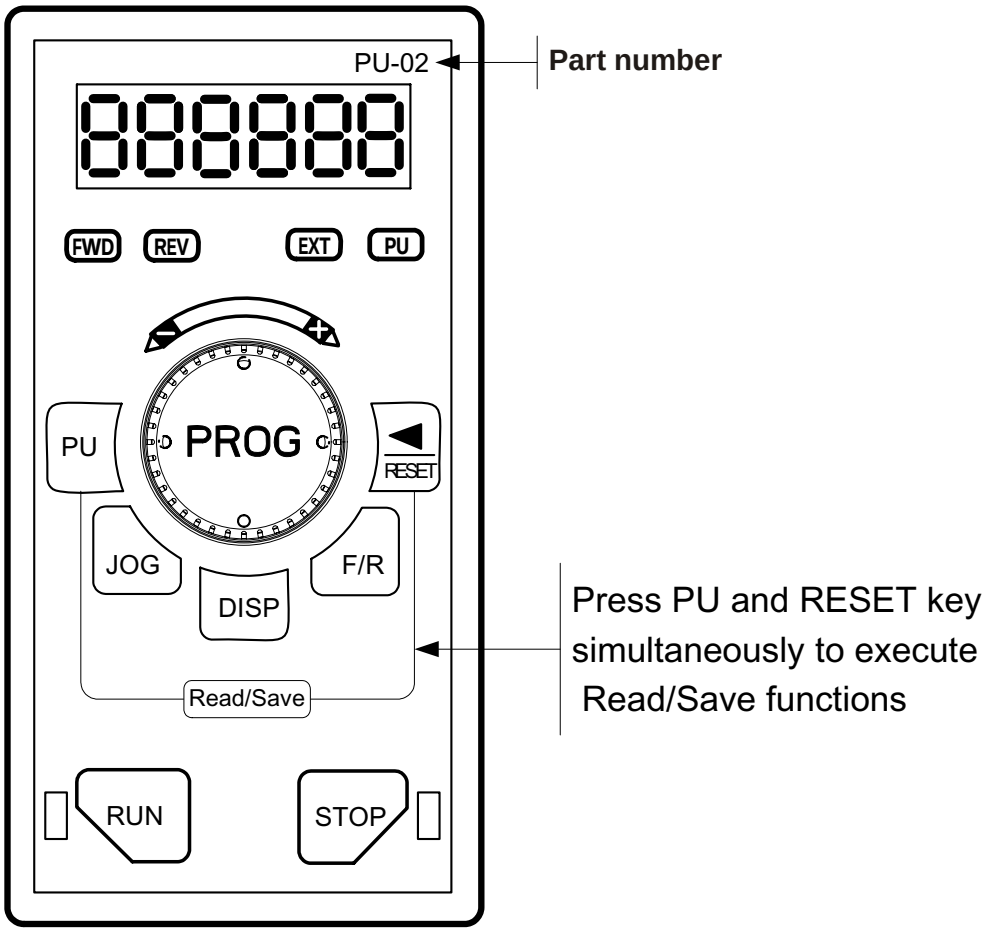
4-1 Description of the Digital Keypad

4-1-1 Digital Keypad PU-01 function descriptions

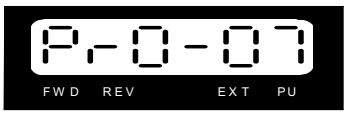


4-1-2 Digital Keypad PU-02 function descriptions

It keeps all function as PU-01 and adds on Parameter Read/Write/Storage/Copy functions. (Valid for Firmware version 2.xx and after only)

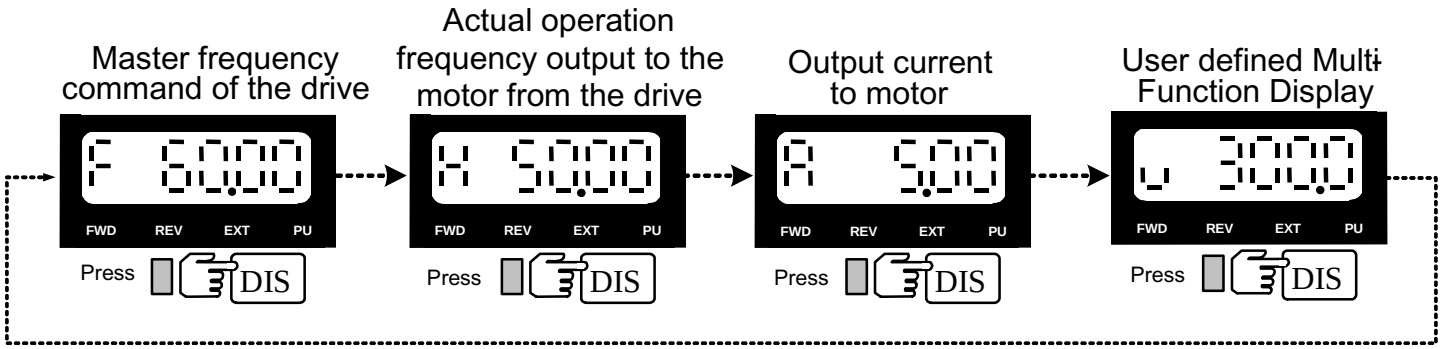


4-2 Explanations of Display Messages

Messages Displayed	Descriptions
	Display master frequency command of the drive (Press the DISP key to read)
	Display actual operation frequency output to the motor from the drive (Press the DISP key to read)
	Display output current to motor (Press the DISP key to read)
	Display User-selected content on Pr0-07 (Press the DISP key to read)
	Display Read/Save selected content (For PU-02 only) (Press the DISP key to read)
	The specified parameter item (Rotate and press the PROG dial to modify, read and Enter) . (Press RESET to display those parameters which data are different from factory default)
	Value of the parameter content (Rotate the PROG dial to modify for setting parameters)
	If the “End” message is displayed , for about 1 second, it is an indication that the data has been accepted and saved to the internal memory.

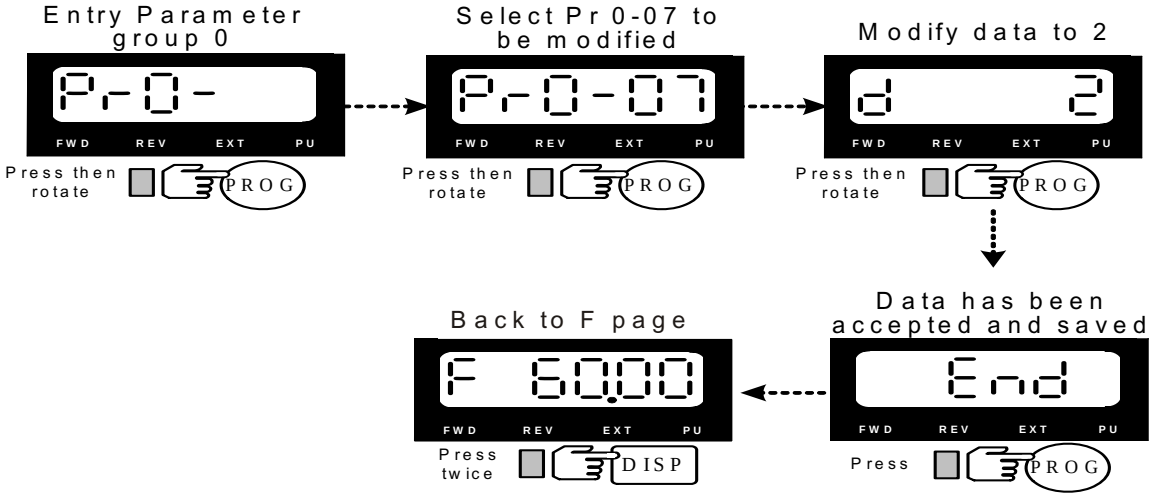
4-3 Operation Steps

4-3-1 Selecting display mode

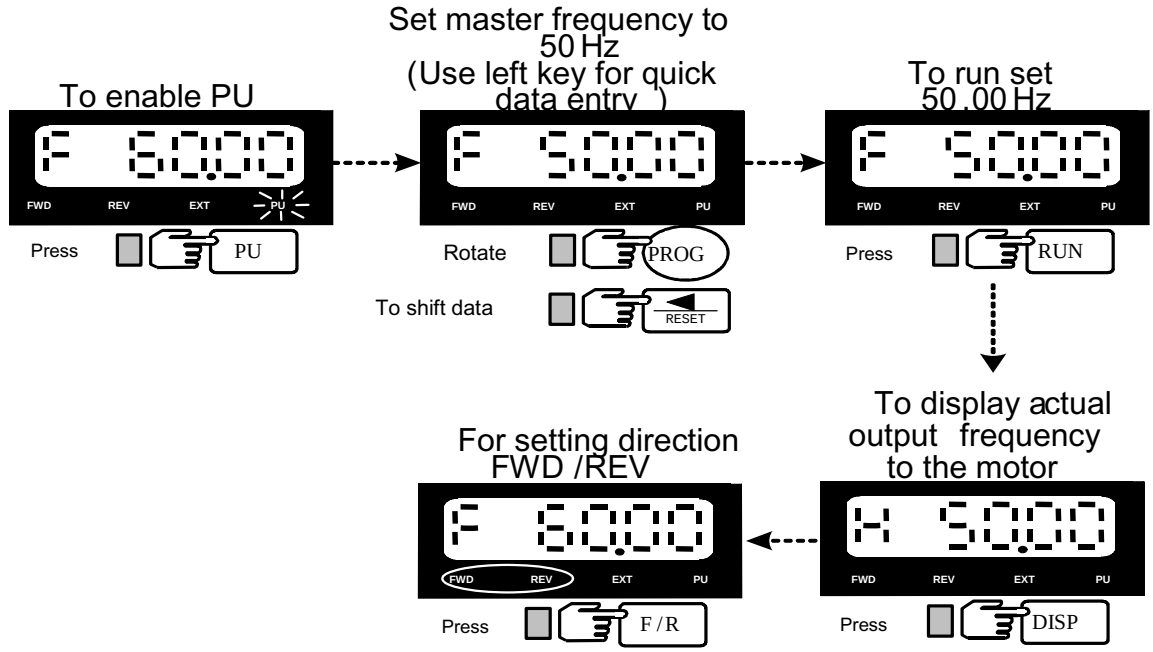


For scrolling between F page , H page, A page and U page b y pressing the DISP key

4-3-2 Setting parameters (For example, to set Pr0-07 = 2)

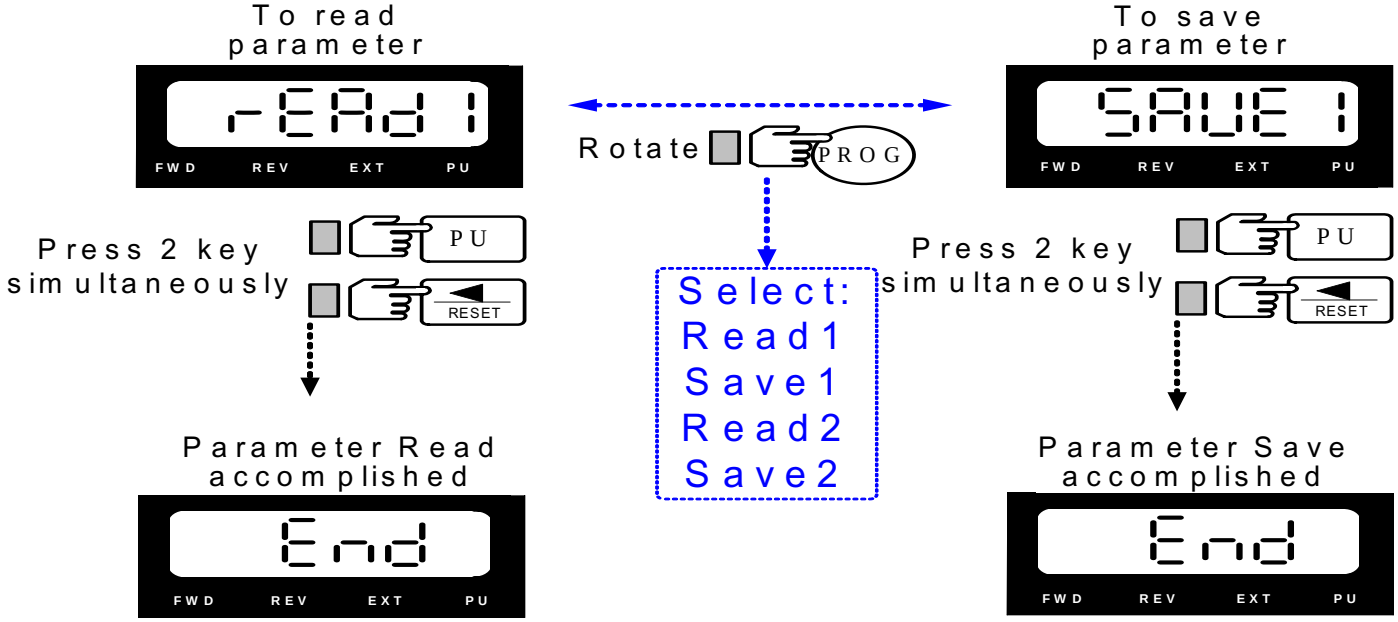


4-3-3 To run (For example, to run 50 Hz from PU)



4-3-4 Parameters READ/SAVE Operation (For PU-02 only)

(Parameter copy can execute between same drive model only)



CHAPTER 5 FUNCTIONS AND PARAMETER SUMMARY

☒=This parameter cannot be set during operation.	♦ : Available in Firmware Version 2.xx and after only.	[ ] Parameter no. in Firmware Version 1.xx

Group 0: System Parameters

	Parameters	Functions	Settings	Factory Setting	User
☒	Pr0-00	Model display	Display according to the model number	Read Only	☒
☒	Pr0-01	Model display	Display according to the model number	Read Only	☒
☒	Pr0-02	Parameter Reset (Motor V/F selecting)	10: Parameter reset for 60Hz, 230V 9: Parameter reset for 50Hz, 220V 8: Parameter reset for 60Hz, 220V 7: Parameter reset for 50Hz, 230V 6: Parameter reset for 60Hz, 240V 5: Parameter reset for 50Hz, 240V	8 ♦ ♦	
	Pr0-03	Password Input (The Key)	0~9999	0	
	Pr0-04	Password set (The Lock)	0~9999	0	
	Pr0-05	Parameter Locking Level	Bit 0=0: All parameters are readable Bit 0=1: Parameters after Pr0-05 are not readable. ”Err” message will be displayed when trying to read them. Bit 1=0: Enable Frequency Command changes Bit 1=1: Disable Frequency Command changes Bit 2=0: Enable run command from keypad Bit 2=1: Disable run command from keypad	b00000	
	Pr0-06	Power-up Display Selection	0: Display the frequency command value(F)(Hz) 1: Display the actual output frequency (H)(Hz) 2: Display the output current (A) (Ampere) 3: Multifunction display (U) (display of Pr0-07)	0	
	Pr0-07	Content of Multi-Function Display	0: Motor speed (RPM) 1: DC-BUS voltage (Vdc) 2: Output voltage (Vac) 3: Output Voltage command (Vac) 4: PID feedback signal value (Hz) 5: Multi-step speed running step no. 6: Sleep time (Pr8-07) 7: Remaining number of times for the “restart after fault” feature (Pr6-10) 8: PID Command frequency (Hz) 9: (Factory Reserved)	0	

			10: Output Power factor angle (º)		
			11: Counter value		
			12: Over-torque accumulated time 1 (Pr5-17)		
			13: (Factory Reserved)		
			14: Dwell Time at Accel. (Pr6-14)		
			15: Dwell Time at Decel. (Pr6-16)		
			16: DC Braking Time during Start-up (Pr6-01)		
			17: DC Braking Time during STOP (Pr6-02)		
			18: Remain time of the executing MSS Run		
			19: (Factory Reserved)		
			20: (Factory Reserved)		
			21: Accumulated power-up Day (day)		
			22: Accumulated power-up time (hh:mm)		
			23: (Factory Reserved)		
			24: (Factory Reserved)		
			25: (Factory Reserved)		
			26: The signal of AVI analog input (Vdc)		
			27: The signal of ACI analog input (mAdc)		
			28: The signal of AUI analog input (Vdc)		
			29: (Factory Reserved)		
			30: (Factory Reserved)		
			31: (Factory Reserved)		
			32: (Factory Reserved)		
			33: (Factory Reserved)		
			34: Over-torque level 1 (Pr5-16)		
			35: Torque compensation gain 1 (Pr5-01)		
			36: (Factory Reserved)		
			37: (Factory Reserved)		
			38: Stall Prevention level (Pr5-12)		
			39 52: (F actory Reserved)		
			53: Output power (kW)		
			54: Output power (kVA)		
			55:(Factory Reserved)		
			56: The temperature of IGBT--OH1 (°C)		
			57: The temperature of heat sink--OH2 (°C)		
			58: (Factory Reserved)		
			59: (Factory Reserved)		
			60: Overload accumulated time (OL)		
			61:(Factory Reserved)		
			62: Compensated voltage		
			63: (Factory Reserved)		
			64: DC Bus voltage upon a fault (Vdc)		
			65: Output voltage upon a fault (Vac)		
			66: Output frequency upon a fault (Hz)		
			67: OH1 value upon a fault (°C)	♦	
			68: Output current value upon a fault (Aac)		
			69: OH2 value upon a fault (°C)	♦	
			70~86: (Factory Reserved)		
			87: DC Bus ripple voltage (Vdc)	♦	
			88: PG frequency (Hz)	♦	
	Pr0-08	User-Defined Coefficient Setting K	0~39 (no use) 40~60000 (the corresponding value for Pr1-00-- the max. frequency)	0	

	Pr0-09	Number of the decimal places	0~3	0	
	Pr0-10	Firmware Version	Read-only	x.xx	
	Pr0-11	EPROM store settings	Bit 0 =1: FWD/REV direction command not memorized Bit 1 =1:PU frequency command not memorized Bit 2 =1:RS-485 frequency command not memorized Bit 3 =1:Up/down frequency command not memorized Bit 4 =1:Changed parameter not memorized	b00000	
	Pr0-12	Optimal Acceleration / Deceleration Setting	0: Linear acceleration/deceleration (Auto accel./decal. disabled) 1: Auto acceleration, linear deceleration 2: Linear acceleration, auto deceleration 3: Auto acceleration/deceleration 4: Linear acceleration/deceleration, but conduct the stall prevention throughout the auto acceleration/deceleration function.	0	
☒	Pr0-13	Time unit for Acceleration Deceleration and S curve	0: Unit: 0.01 Sec 1: Unit: 0.1 Sec 2: Unit: 1 Sec	0	
	Pr0-14	Carrier Frequency Upper Bound	0=0.7kHz 1~18kHz	10	
	Pr0-15	Carrier Frequency Lower Bound	0=0.7kHz 1~18kHz	10	
	Pr0-16	Automatic Voltage Regulation (AVR)	0: AVR function enabled 1: AVR function disabled 2: AVR function disabled during deceleration	0	
	Pr0-17	Automatic Energy-Saving Operation (AESO) and others	Bit 0=0: Disable AESO Bit 0=1: Enable AESO Bit 1=0: Maximum output voltage could be higher than the source voltage Bit 1=1: Maximum output voltage equal to the source voltage Bit 2=0: General purpose constant torque application. Bit 2=1: Fan and pump variable torque application . Bit 3=0: Regen torque without slip compensation Bit 3=1: Regen torque with slip compensation Bit 4=0: Low noise mode operation Bit 4=1: Quiet mode operation	b00000	

	Pr0-18	Source of the Master Frequency Command	0: The digital keypad (PU)		0	
			1: The RS485 communication port			
			2: The external analog signal			
			3: The external up/down terminals (multi-function input terminals)			
			4: The Pulse input (A PG Feedback Card (optional) is necessary.)	♦		
	Pr0-19	Source of the Operation Command	0: RS485 serial communication or Digital keypad (PU)	0		
			1: External terminals or Digital keypad (PU)			
			2: Digital keypad (PU)			
			3: External terminals			
	Pr0-20	Stop Methods and Run safety lockout	Bit 0=0: Ramp to stop	b00000		
			Bit 0=1: Coast to stop			
			Bit 1=0: Not restart after reset			
			Bit 1=1: Restart after reset			
			Bit 2=0: Line Start Lockout is enabled			
			Bit 2=1: Line Start Lockout is disabled			
			Bit 3=0: The transition between FWD/REV going through 0 point			
			Bit 3=1: The transition between FWD/REV not going through 0 point			
			Bit 4=0: linear accel and decel at high speed zone			
			Bit 4=1: S-curve accel and decel at high speed zone			
	Pr0-21	Reverse Operation	0: Enable Forward/Reverse operation	0		
			1: Disable Reverse operation			
			2: Disable Forward operation			
	Pr0-22	Timer After stopped	0.00~60.00sec	0.00		
	Pr0-23	Fan control	Bit 0=0:when power is applied, the fan will turn on	b00000		
			Bit 0=1:When the run command is given, the fan will turn on			
	Pr0-24	Frequency setting resolution of Fly-shuttle dial on PU	0=0.01 Hz	1		
			1=0.10Hz			
			2=1.00Hz			
			3=10.00 Hz			
☒ ♦	Pr0-25	Parameter Team selection	0: Team A	0		
			1: Team B			
			2: Select Team A or Team B by MI3			

Group 1: Basic Parameters

	Parameters	Functions	Settings	Factory Setting	User
☒	Pr1-00	Maximum Operation Frequency	50.0~600.00Hz	60.00/50.00	
☒	Pr1-01	1st Frequency Setting 1 (Base Frequency) (FBASE 1)	0.00~600.00 Hz	60.00/50.00	
	Pr1-02	1st Voltage Setting 1 (Motor rated voltage) (VBASE 1)	230V models: 0.0~255.0V	230V:230.0	
☒	Pr1-03	2nd Frequency Setting 1 (Middle Frequency 1) (FMID 1)	0.00~600.00 Hz	0.50	
	Pr1-04	2nd Voltage Setting 1 (Middle Voltage 1) (VMID 1)	230V models: 0.0~255.0V	230V:5.0	
☒	Pr1-05	3rd Frequency Setting 1 (Low-point Frequency 1) (FLOW 1)	0.00~600.00 Hz	0.50	
	Pr1-06	3rd Voltage Setting 1 (Low-point Voltage 1)(VLOW 1)	230V models: 0.0~255.0	230V:5.0	
	Pr1-07	0Hz Output Voltage Setting 1 (V0Hz 1)	230V models: 0.0~255.0	0.0	
	Pr1-08	Startup Frequency	0.00~600.00 Hz	0.50	
	Pr1-09	Output Frequency Upper Limit	0.0~150.0% of Maximum Operation Frequency (Pr1-00)	110.0	
	Pr1-10	Output Frequency Lower Limit	0.0~100.0% of Maximum Operation Frequency (Pr1-00)	0.0	
	Pr1-11	Acceleration Time 1	0.00~60000 Sec	10.00/60.00	
	1-12	Deceleration Time 1	0.00~60000 Sec	10.00/60.00	
	Pr1-13	Acceleration Time 2	0.00~60000 Sec	10.00/60.00	
	Pr1-14	Deceleration Time 2	0.00~60000 Sec	10.00/60.00	
	Pr1-15	JOG Acceleration Time	0.00~60000 Sec	10.00/60.00	
	Pr1-16	JOG Deceleration Time	0.00~60000 Sec	10.00/60.00	
	Pr1-17	JOG Frequency	0.00~600.00 Hz	6.00	
	Pr1-18	1st/2nd Acceleration/Deceleration Frequency	0.00~600.00 Hz	0.000	
	Pr1-19	S-Curve for Acceleration Departure Time	0.00~12000 Sec	0.00	
	Pr1-20	S-Curve for Acceleration Arrival Time	0.00~12000 Sec	0.00	
	Pr1-21	S-Curve for Deceleration Departure Time	0.00~12000 Sec	0.00	
	Pr1-22	S-Curve for Deceleration Arrival Time	0.00~12000 Sec	0.00	

	Pr1-23 [Pr1-29]	Offset voltage at decel	230V models: -50.0~50.0 V	0.00	
☒	Pr1-24 [Pr1-23]	Skip Frequency 1 upper limit	0.00~600.00Hz	0.00	
☒	Pr1-25 [Pr1-24]	Skip Frequency 1 lower limit	0.00~600.00Hz	0.00	
☒	Pr1-26 [Pr1-25]	Skip Frequency 2 upper limit	0.00~600.00Hz	0.00	
☒	Pr1-27 [Pr1-26]	Skip Frequency 2 lower limit	0.00~600.00Hz	0.00	
☒	Pr1-28 [Pr1-27]	Skip Frequency 3 upper limit	0.00~600.00Hz	0.00	
☒	Pr1-29 [Pr1-28]	Skip Frequency 3 lower limit	0.00~600.00Hz	0.00	
☒ ♦	Pr1-30	Skip Frequency 4 upper limit	0.00~600.00 Hz	0.00	
☒ ♦	Pr1-31	Skip Frequency 4 lower limit	0.00~600.00 Hz	0.00	
☒ ♦	Pr1-32	Skip Frequency 5 upper limit	0.00~600.00 Hz	0.00	
☒ ♦	Pr1-33	Skip Frequency 5 lower limit	0.00~600.00 Hz	0.00	
☒ ♦	Pr1-34	Skip Frequency 6 upper limit	0.00~600.00 Hz	0.00	
☒ ♦	Pr1-35	Skip Frequency 6 lower limit	0.00~600.00 Hz	0.00	
☒ ♦	Pr1-36	1st Frequency Setting 2 (Base Frequency) (FBASE 2)	0.00~600.00 Hz	60.00/50.00	
☒ ♦	Pr1-37	1st Voltage Setting 2 (Motor rated voltage) (VBASE 2)	230V models: 0.0~255.0V	230V:230	
☒ ♦	Pr1-38	2nd Frequency Setting 2 (Middle Frequency 2) (FMID 2)	0.00~600.00 Hz	0.50	
☒ ♦	Pr1-39	2nd Voltage Setting 2 (Middle Voltage 2) (VMID 2)	230V models: 0.0~255.0V	230V:5.0	
☒ ♦	Pr1-40	3rd Frequency Setting 2 (Low-point Frequency 2) (FLOW 2)	0.00~600.00 Hz	0.50	
☒ ♦	Pr1-41	3rd Voltage Setting 2 (Low-point Voltage 2) (VLOW 2)	230V model: 0.0~255.0V	230V:5.0	
☒ ♦	Pr1-42	0Hz Output Voltage Setting 2 (V0Hz 2)	230V model: 0.0~255.0V	0.0	

Group 2: Digital Input/Output Parameters

	Parameters	Functions	Settings	Factory Setting	User
☒	Pr2-00	2-Wire/3-Wire Operation Control	0: 2-wire operation control (1): FWD/STOP, REV/STOP	0	
			1: 2-wire operation control (2): RUN/STOP, REV/FWD		
			2: 3-wire Operation (momentary push button)		
☒	Pr2-01	Multi-Function Digital Input Command 1 (MI1)	0: No definition	1	
☒	Pr2-02	Multi-Function Digital Input Command 2 (MI2)	1: Multi-step speed command 1	2	
☒	Pr2-03	Multi-Function Digital Input Command 3 (MI3)	2: Multi-step speed command 2	3	
☒	Pr2-04	Multi-Function Digital Input Command 4 (MI4)	3: Multi-step speed command 3	4	
☒	Pr2-05	Multi-Function Digital Input Command 6 (MI6)	4: Multi-step speed command 4	5	
☒	Pr2-06	Multi-Function Input Command 6 (MI6)	5: External Reset (NO)	14	
			6: Clear counter		
			7: The 1st, 2nd acceleration/ deceleration time selection		
			8: Acceleration/deceleration speed inhibit		
			9: Frequency command from AVI		
			10: Frequency command from ACI		
			11: Frequency command from AUI		
			12: Emergency Ramp Stop		
			13: PID function disabled		
			14: EF input (External fault input terminal)		
			15: B.B. traces from the bottom upward		
			16: B.B. traces from the top downward		
			17: Operation command from External terminal.		
			18: Cancel the setting of the optimal acceleration/ deceleration time		
			19: FWD JOG command		
			20: REV JOG command		
			21: JOG command		
			22: Cancel PLC Run		
			23: Pause PLC Run		
			24: Digital Up command		
			25: Digital Down command		
			26: Zero speed is replaced by DC braking		
			27: Pause		
			28: Disable Dwell function		

			29: Disable traverse function			
			30: Disable Speed Search during Start-up			
			31: EEPROM write function disable			
			32: Counter Trigger (MI2 terminal only)			
			42: Motor Selection ♦			
			43: Confirm signal of Motor selection ♦			
	Pr2-07	The Acceleration /Deceleration mode of the UP/DOWN command	Bit 0	0: Up command, drive accel according to Accel time	b00000	
				1: Up command, drive accel according to Pr2-08 setting		
			Bit 1	0: Down command, drive decel according to Decel time		
				1: Down command, drive decel according to Pr2-08 setting		
			Bit 2	(Factory Reserved)		
			Bit 3	0: FWD/REV terminals action by Edge Trigger		
				1: FWD/REV terminals action by Level Trigger		
			Bit 4	0: PG feed-back over compensation during Accel is allowed		
				1: PG feed-back over compensation during Accel is not allowed		
	Pr2-08	The specific Acceleration /Deceleration of the UP/DOWN command	0.01~1.00Hz/msec		0.01	
	Pr2-09	Digital Input Terminal De-bouncing Time	0.001~30.000 Sec		0.005	
	Pr2-10	Digital Input terminals status select	00000~000FF		h00000	
			0=Short circuit active 1=Open circuit active			
	Pr2-11	Terminal Count Value	0~65500		0	
	Pr2-12	Preliminary Count Value	0~65500		0	
	Pr2-13	Digital Pulse Output Gain	1~20		1	
	Pr2-14	Pre-set Arrival Frequency 1	0.00~600.00 Hz		60.00/50.00	
	Pr2-15	Pre-set Arrival Frequency 1 band width	0.00~600.00 Hz		2.00	
	Pr2-16	Pre-set Arrival Frequency 2	0.00~600.00 Hz		60.00/50.00	
	Pr2-17	Pre-set Arrival Frequency 2 band width	0.00~600.00 Hz		2.00	
	Pr2-18	Multi-Function Output Direction	Bit 0~Bit 3 separate setting as table in below		b00000	

♦	Pr2-19	Delay time of Multi-Function Output terminals	0.000~60.000 Sec	0.003	
	Pr2-20 [Pr2-19]	Multi-Function Output 1 (Relay 1)	1: Drive running	11	
	Pr2-21 [Pr2-20]	Multi-Function Output 2 (Relay 2)	2: Master frequency attained 1 (Both Forward and Reverse)	1	
	Pr2-22 [Pr2-21]	Multi-Function Output 3 (MO1)	3: Master frequency attained 2 (Both Forward and Reverse)	5	
	Pr2-23 [Pr2-22]	Multi-Function Output 4 (MO2)	4: Pre-set speed attained 1 (Both Forward and Reverse)	9	
			5: Pre-set speed attained 1 (Forward only)		
			6: Pre-set speed attained 2 (Both Forward and Reverse)		
			7: Pre-set speed attained 2 (Forward only)		
			8: Drive in decel		
			9: Drive ready for use		
			10: Low voltage alarm (LU, LUr)		
			11: Fault Indication		
			12: Base block (B.B.) Indication		
			13: Zero Speed (including shutdown)		
			14: Zero speed (while in run)		
			15: Terminal Count Value Attained		
			16: Preliminary Count Value Attained		
			17: PLC Run running		
			18: PLC Run paused		
			19: A step of PLC Run completed		
			20: PLC Run completed		
			21: IGBT over-heat indication (oH1)		
			22: Dwell Accel/Decel interruption		
			23: Operation Mode indication		
			24: Over-torque 1 (ot1)		
			25: Digital frequency signal output (only MO2)		
			26: Software braking output (MO1, Pr2-22 only)		
			27: Auxiliary Motor no. 1		
			28: Auxiliary Motor no. 2		
			29: Auxiliary Motor no. 3		
			30: Over-torque 2 (ot2) ♦		
			31: Heatsink over-heat indication (oH2) ♦		
			32: Motor selection output (Pr5-49) ♦		
			48~63: PLC Run step indication		

Group 3: Analog Input/Output Parameters

	Parameters	Functions	Settings	Factory Setting	User
	Pr3-00	Addition Function of the Analog Inputs	0: enable addition function 1: disable addition function (AVI,ACI, AUI)	0	
	Pr3-01	Analog Input Noise Filter	0.00~2.00 sec	0.10	
	Pr3-02 ACI (Pr3-06) and AUI (Pr3-11)	AVI Analog Input (External Analog command)	0: No functions 1: Frequency command 2: Acceleration/deceleration time gain (increase or decrease time base) 3: Over-current stall prevention level during operation 4: Over-current stall prevention level during Acceleration 5: Over-torque current level 6: Torque compensation gain 7: AVI auxiliary frequency (multiplication by the ratio of AVI) 8: ACI auxiliary frequency (multiplication by the ratio of ACI) 9: AUI auxiliary frequency (multiplication by the ratio of AUI) 10: Auxiliary frequency of master frequency 11: PID feedback signal 12: PID offset signal 13: DC Braking Current Level (same as Pr6-00) 14: Torque adjust during run. (AVI Pr3-02 only) 15: External temperatures signal	1	
	Pr3-03	AVI Analog Input Bias	-10.00~10.00V	0.00	
	Pr3-04	AVI Analog Input Gain	-500.0~+500.0%	100.0	
	Pr3-05	AVI Positive/Negative Bias Mode	0: Zero bias 1: Value lower than bias = bias 2: Value higher than bias = bias 3: The absolute value of the bias voltage while serving as the center	0	
	Pr3-06	ACI Analog Input	Same as Pr3-02	0.00	
	Pr3-07	ACI Analog Input Bias	0.00~20.00mA	4.00	
	Pr3-08	ACI Analog Input Gain	-500.0~+500.0%	100.0	
	Pr3-09	ACI Positive/Negative Bias Mode	0:zero bias 1: value lower than bias = bias 2: value higher than bias = bias 3: the absolute value of the bias voltage while serving as the center	1	

	Pr3-10	Loss of the ACI signal	0: disabled 1: Continue operation by the last frequency cmd 2: Decelerate to stop 3: Coast to stop and display ACI	0	
	Pr3-11	AUI Analog Input	(Same as Pr3-02)	0.00	
	Pr3-12	AUI Analog Input Bias	-10.00~10.00V	0.00	
	Pr3-13	AUI Analog Input Gain	-500.0~+500.0%	100	
	Pr3-14	AUI Positive/Negative Bias Mode	0: zero bias 1: value lower than bias = bias 2: value higher than bias = bias 3: the absolute value of the bias voltage while serving as the center	0	
	Pr3-15	AVO Analog Output 1 Selection	0: Output frequency (Hz)	0	
	Pr3-16	ACO Analog Output 2 Selection	1: Command frequency (Hz) 2: Motor Speed 3: Output current (A rms) 4: Output voltage (VAC) 5: DC BUS voltage (VDC) 6: Power factor 7: Power 8: AVI (V) 9: ACI (mA) 10: AUI (V) 13: Voltage command 14: Counter Value 15: Analog Output Value	0	
	Pr3-17	AVO Analog Output Gain	-900.0~900.0%	100.0	
	Pr3-18	ACO Analog Output Gain	-900.0~900.0%	80.0	
	Pr3-19	AVO Analog Output Bias Voltage	-10.00~10.00V	0.00	
	Pr3-20	ACO Analog Output Bias Current	0.00~20.00mA	4.00	
	Pr3-21	Analog Output Value	0.0~100.0%	0.0	

Group 4: Multi-Step Speed and Process Logic Control Operation Parameters

	Parameters	Functions	Settings	Factory Setting	User
	Pr4-00	The 1st Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	
	Pr4-01	The 2nd Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	
	Pr4-02	The 3rd Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	

	Pr4-03	The 4th Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	
	Pr4-04	The 5th Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	
	Pr4-05	The 6th Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	
	Pr4-06	The 7th Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	
	Pr4-07	The 8th Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	
	Pr4-08	The 9th Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	
	Pr4-09	The 10th Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	
	Pr4-10	The 11th Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	
	Pr4-11	The 12th Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	
	Pr4-12	The 13th Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	
	Pr4-13	The 14th Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	
	Pr4-14	The 15th Step Speed Frequency of PLC Run or MSS Run	0.00~600.00 Hz	0.00	
	Pr4-15	Time Duration of the PLC Run Master Speed	0.0~65500 Sec	0.0	
	Pr4-16	The 1st Step Duration of PLC Run or MSS Run	0.0~65500 Sec	0.0	
	Pr4-17	The 2ndStep Duration of PLC Run or MSS Run	0.0~65500 Sec	0.0	
	Pr4-18	The 3rd Step Duration of PLC Run or MSS Run	0.0~65500 Sec	0.0	
	Pr4-19	The 4th Step Duration of PLC Run or MSS Run	0.0~65500 Sec	0.0	
	Pr4-20	The 5th Step Duration of PLC Run or MSS Run	0.0~65500 Sec	0.0	
	Pr4-21	The 6th Step Duration of PLC Run or MSS Run	0.0~65500 Sec	0.0	
	Pr4-22	The 7th Step Duration of PLC Run or MSS Run	0.0~65500 Sec	0.0	

	Pr4-23	The 8th Step Duration of PLC Run or MSS Run	0.0~65500 Sec		0.0	
	Pr4-24	The 9th Step Duration of PLC Run or MSS Run	0.0~65500 Sec		0.0	
	Pr4-25	The 10th Step Duration of PLC Run or MSS Run	0.0~65500 Sec		0.0	
	Pr4-26	The 11th Step Duration of PLC Run or MSS Run	0.0~65500 Sec		0.0	
	Pr4-27	The 12th Step Duration of PLC Run or MSS Run	0.0~65500 Sec		0.0	
	Pr4-28	The 13th Step Duration of PLC Run or MSS Run	0.0~65500 Sec		0.0	
	Pr4-29	The 14th Step Duration of PLC Run or MSS Run	0.0~65500 Sec		0.0	
	Pr4-30	The 15th Step Duration of PLC Run or MSS Run	0.0~65500 Sec		0.0	
	Pr4-31	The PLC Run or MSS Run Time Multiplier	1~10		1	
	Pr4-32	The PLC Run or MSS Run Operation Direction	00000~07FFF(0:forward ; 1:reverse)		h00000	
	Pr4-33	PLC Run Operation Mode	Bit 0	0: direction determined by Pr4-32	b00000	
				1: direction determined by the master speed		
			Bit 1	0: Without zero intervals (Continue mode)		
				1: With zero intervals (Stop mode)		
			Bit 2	0: Run zero speed when PLC Run Paused		
				1: Run original programmed step speed when PLC Run Paused		
			Bit 3	0: Re-Execute PLC Run from step 0 after recover from power interruption		
				1: Continue Execute PLC Run from the point which power was interrupted. After recovering from power interruption		
	Pr4-34	PLC Run operation Cycle	0: PLC Run disabled		0	
			1~60000 : 1~60000 cycle			
			60001: Continuously execute program cycles			
	Pr4-35	What to do after PLC Run is completed	0~15:step speed (0=master speed)		16	
			16:stop			
	Pr4-36	Multi-Step Speed Run (MSS RUN) Operation Mode	Bit 0	0: Direction determined by Pr4-32	b00001	
				1: Direction determined by the master speed		
			Bit 1	0: Duration of MSS Run determined by Mix terminals.		
				1: Duration of MSS Run determined by Pr4-15~Pr4-30 setting.		
			Bit 2	0: Without zero intervals (Continue mode)		
				1: With zero intervals (Stop mode)		
			Bit 3	0: PID offset disabled		
				1: MSS Run + PID offset		

Group 5: Motor Parameters and Protection Parameters

	Parameters	Functions	Settings	Factory Setting	User
☒	Pr5-00	Full-Load Current of Motor 1	Amp (10~120% of drive's rated current)	XxxA (100%)	
	Pr5-01	Auto Torque Compensation of Motor 1	0.0~25.0%	0.0	
	Pr5-02	Slip Compensation of Motor 1	0~60 RPM	0	
	Pr5-03	Number of Motor Poles 1	2~20	4	
	Pr5-04	Rotor Resistance R1 of Motor 1	0.0~6553.5 mΩ	0	
☒	Pr5-05	Auto-tuning & control mode selection	0: No function 1: To execute auto-tuning and switch to Sensorless vector control mode 2: Reset to V/F control mode	0	
☒	Pr5-06	Low Voltage Level I	230V models: 160~220VAC	230V:180	
☒	Pr5-07	Over-Voltage Stall Prevention Level	230V models: 320~500VDC	230V:380	
	Pr5-08	Software Braking Level	230V models: 320~500VDC	230V:373	
	Pr5-09	Factory Reserved	Factory Reserved	0	☒
	Pr5-10	Over- Current Stall Prevention level during accel on the constant torque region	Amp (10~250% of drive's rated current)	A (170%)	
	Pr5-11	Over- Current Stall Prevention low-limit level during accel on the constant power region	Amp (0~250% of drive's rated current)	A (120%)	
	Pr5-12	Over-Current Stall Prevention level, during constant speed on the constant torque region Operation	Amp (10~250% of drive's rated current)	A (170%)	
	Pr5-13	Over- Current Stall Prevention low-limit level during constant speed run on the constant power region	Amp (0~250% of drive's rated current)	A (120%)	

	Pr5-14	Over-Current Deceleration Time during Operation	0.050~600.00 Sec	3.00	
	Pr5-15	Over-Torque Detection Selection 1 (ot1)	0:Disabled 1:Over-torque detection during constant speed operation, stop operation after detection. 2:Over-torque detection during constant speed operation, continue to operate after detection. 3:Over-torque detection during operation, stop operation after detection 4:Over-torque detection during operation, continue operation after detection.	0	
	Pr5-16	Over-Torque Detection Level 1 (ot1)	Amp (20~250% of drive's rated current)	A (150%)	
	Pr5-17	Over-Torque Detection Time 1 (ot1)	0.0~60.0 Sec	0.1	
	Pr 5-18	Motor 1- Electronic Thermal Relay Selection (oL1)	0:Electronic thermal relay function disabled 1:Inverter duty motor (with independent cooling fan) 2:Standard motor (with shaft mounted cooling fan)	0	
	Pr5-19	Motor 1- Electronic Thermal Relay Characteristic	30~600 Sec	60	
	Pr5-20	IGBT Over-Heat pre–warning setting (oH2)	0.0~110.0	85.0	
	Pr5-21	Over-Torque Detection Selection 2 (ot2)	0: Disabled 1: Over-torque detection during constant speed operation, stop operation after detection. 2: Over-torque detection during constant speed operation, continue to operate after detection. 3: Over-torque detection during entire (acceleration, steady state, deceleration) operation, stop operation after detection 4: Over-torque detection during entire (acceleration, steady state, deceleration) operation, continue operation after detection.	0	
	Pr5-22	Over-Torque Detection Level 2 (ot2)	Amp (20~250% of drive's rated current)	A (150%)	
	Pr5-23	Over-Torque Detection Time 2 (ot2)	0.0~60.0 Sec	0.1	
	Pr5-24 [Pr5-21]	Most Recent Fault Record	0: no fault	0	
	Pr5-25 [Pr5-22]	2nd Most Recent Fault Record	1: oC (over-current)		
	Pr5-26 [Pr5-23]	3rd Most Recent Fault Record	2: oU (over-voltage)		
	Pr5-27 [Pr5-24]	4th Most Recent Fault Record	3: GF (ground fault)		
♦	Pr5-28	5th Most Recent Fault Record	4: SC (IGBT failure)		
♦	Pr5-29	6th Most Recent Fault Record	5: oL (drive overload)		
♦	Pr5-30	7th Most Recent Fault Record	6: oL1 (electronic thermal relay 1)		
♦	Pr5-31	8th Most Recent Fault Record	7: ot1 (Over-Torque1)		
♦	Pr5-32	9th Most Recent Fault Record	8: oCn (over-current during constant speed)		
♦	Pr5-33	10th Most Recent Fault Record	9: oCA (over-current during accel.)		

♦	Pr5-34	11th Most Recent Fault Record	10: oCd (over-current during decel.)		
♦	Pr5-35	12th Most Recent Fault Record	11: EP1 (EPROM error 1)		
♦	Pr5-36	13th Most Recent Fault Record	12: EP2 (EPROM error 2)		
♦	Pr5-37	14th Most Recent Fault Record	13: EF (external fault)		
♦	Pr5-38	15th Most Recent Fault Record	14: Ct1 (current sensor 1)		
♦	Pr5-39	16th Most Recent Fault Record	15: Ct2 (current sensor 2)		
			16: HPF (protection circuit fault)		
			17: oH1 (IGBT overheat)		
			18: oH2 (Heatsink overheat)		
			19: SoFt (Pre-charge circuit error)		
			20: ACI. (ACI error)		
			21: ASC (RS-485 error)		
			22: PI.d (PID error)		
			23: Pu (Keypad communication overtime)		
			24: tunE (Auto tuning failure)		
			25: bF (braking chopper failure)		
			26: PG (PG error)		
			27: PHL (Phase loss)		
			28: CC (current signal error during stop)		
			29: CPu (CPU error)		
			30: FAn (Fan failure)		
			31: AnI fault (Analog input error)		
			32: ot2 (Over-Torque2)	♦	
			33: oL2 (electronic thermal relay 2)	♦	
			34: rnot (Motor selection error)	♦	
			36: LUr (Low Voltage during Run)	♦	
			37: oUd (over-voltage during decel)		
			38: `x CoPY (Parameter copy error)	♦	
			39: LU (Low Voltage)		
			40: bb (External Base Block)		
☒ ♦	Pr5-40	Full-Load Current of Motor 2	Amp (10~120% of drive's rated current)	xxxA (100%)	
♦	Pr5-41	Auto Torque Compensation of Motor 2	0.0~25.0%	0.0	
♦	Pr5-42	Slip Compensation of Motor 2	0~60 RPM	0	
♦	Pr5-43	Number of Motor Poles 2	2~20	4	
♦	Pr5-44	Rotor Resistance R1 of Motor 2	0.0~6553.5 mΩ	0	

♦	Pr5-45	Motor 2- Electronic Thermal Relay Selection (oL2)	0: Electronic thermal relay function disabled 1: Inverter duty motor (with independent cooling fan) 2: Standard motor (with shaft mounted cooling fan)		0	
♦	Pr5-46	Motor 2- Electronic Thermal Relay Characteristic	30~600 Sec		60	
♦	Pr5-47	Heatsink-Over-Heat pre–warning setting (oH2)	0.0~110.0 °C		85.0	
♦	Pr5-48	Delay Time for Motor Selection	0.00~60.00 Sec		0.05	
♦	Pr5-49	Motor selection mode	Bit 0	0: Cannot be switched during operation. 1: Can be switched during operation.	b00000	
			Bit 1	0: No need to wait for confirmation signal when switching 1: Must wait for confirmation signal when switching		

Group 6: Special Parameters

	Parameters	Functions	Settings	Factory Setting	User
	Pr6-00	DC Braking Current Level	Amp (0~125% of drive's rated current)	A (0%)	
	Pr6-01	DC Braking Time during Start-up	0.00~60.00 Sec	0.00	
	Pr6-02	DC Braking Time during stopping	0.00~60.00 Sec	0.00	
	Pr6-03	Start-point for DC Braking during stopping	0.00~600.00 Hz	0.00	
	Pr6-04	Increasing Rate of the DC Braking Voltage	0.01~300.00%	50.00%	
	Pr6-05	Momentary Power Loss Operation Selection	0:Operation stops after momentary power loss. 1: Operation continues after momentary power loss, speed search starts with last output frequency downward 2: Operation continues after momentary power loss, speed search starts with the start-up frequency upward	0	
	Pr6-06	Maximum Allowable Power Loss Time	0.1~5.0 Sec	2.0	
	Pr6-07	Base-Block Time for Speed Search (BB)	0.1~5.0 Sec	0.5	
	Pr6-08	Maximum Current Level for Speed Search	Amp (20~200% of drive's rated current)	A (120%)	
	Pr6-09	Deceleration Time for Speed Search	0.50~120.00 Sec	3.00	
	Pr6-10	Auto Restart after Fault	0~10 times	0	
	Pr6-11	Speed Search during Start-up	0: speed search disabled 1: speed search through the frequency command	0	

			2: FWD-speed search only (motor only runs in FWD direction) 3: REV-speed search only (motor only runs in REV direction) 4: FWD/REV speed search enabled in both directions (FWD first) 5: REV/FWD speed search enabled in both directions (REV first)		
	Pr6-12	Speed Search Frequency (FWD direction)	0.00~600.00 Hz	60.00/50.00	
	Pr6-13	Speed Search Frequency (REV direction)	0.00~600.00 Hz	60.00/50.00	
	Pr6-14	Dwell Time at Accel.	0.00~60.00 Sec	0.00	
	Pr6-15	Dwell Frequency at Accel.	0.00~600.00 Hz	6.00	
	Pr6-16	Dwell Time at Decel.	0.00~60.00 Sec	0.00	
	Pr6-17	Dwell Frequency at Decel.	0.00~600.00 Hz	6.00	
	Pr6-18	Dwell Frequency current	Amp (0~150% of rated current)	A (0%)	
	Pr6-19	Traverse Skip Frequency	0.00~100.00Hz	0.00	
	Pr6-20	The Amplitude of traverse	0.00~200.00Hz	0.00	

Group 7: High-function Parameters (PID and Communication)

	Parameters	Functions	Settings	Factory Setting	User
	Pr7-00	Proportional Gain (P)	0.0~500.0%	80.0	
	Pr7-01	Integral Time (I)	0.00~100.00 Sec 0.00:no integral	1.00	
	Pr7-02	Derivative Control (D)	0.00~5.00 Sec	0.00	
	Pr7-03	Upper limit for Integral Control	0.0~100.0%	100.0	
	Pr7-04	PID Output Frequency Limit	0.0~100.0%	100.0	
	Pr7-05	PID Offset	-100.0~+100.0%	0.0	
	Pr7-06	Primary Delay Filter Time	0.000~0.100 Sec	0.000	
	Pr7-07	PID Feedback Signal Detection Time	0.0~6000.0 Sec	0.0	
	Pr7-08	Treatment of the Erroneous PID Feedback Signals	0: warn and keep operating 1: warn and RAMP to stop 2: warn and COAST to stop	0	
	Pr7-9	Treatment of Keypad Transmission Fault	0: Warn and RAMP to stop 1: Warn and COAST to stop	0	
	Pr7-10	Keypad Transmission Fault detection	0.0: Disable and keep operating 0.1~60.0 Sec	0.0	
	Pr7-11	Communication Address	1~254	1	
	Pr7-12	Transmission Speed (Baud rate)	1.2~125 Kbps	9.6	
	Pr7-13	Transmission Fault Treatment	0: warn and keep operating 1: warn and RAMP to stop 2: warn and COAST to stop	3	

			3: No warning and keep operating		
	Pr7-14	Time-out Detection	0.0: disabled 0.1~60.0 Sec	0.0	
	Pr7-15	Communication Protocol	0:7,N,2 ASCII 1:7,E,1 ASCII 2:7,O,1 ASCII 3:7,E,2 ASCII 4:7,O,2 ASCII 5:8,N,1 ASCII 6:8, N,2 ASCII 7:8,E,1 ASCII 8:8,O,1 ASCII 9:8,E,2 ASCII 10:8,O,2 ASCII 11:8,N,1 RTU 12:8,N,2 RTU 13:8,E,1 RTU 14:8,O,1 RTU 15:8,E,2 RTU 16:8,O,2 RTU	0	

Group 8: Fan & Pump Control Parameters

	Parameters	Functions	Settings	Factory Setting	User
☒	Pr8-00	V/F Curve Selection	0: V/F Curve determined by Parameter Group 1 1: 1.5 Power Curve 2: Square Power Curve	0	
	Pr8-01	Start-Up Frequency of the Auxiliary Motor	0.00~600.00 Hz	0.00	
	Pr8-02	Stop Frequency of the Auxiliary Motor	0.00~600.00 Hz	5.00	
	Pr8-03	Time Delay before Stopping the Auxiliary Motor	0.0~6000.0 Sec	0.00	
	Pr8-04	Time Delay before Stopping the Auxiliary Motor	0.0~6000.0 Sec	0.00	
	Pr8-05	Sleep Frequency	0.00~600.00 Hz	0.00	
	Pr8-06	Wake-up Frequency	0.00~600.00 Hz	0.00	
	Pr8-07	Sleep Time	0.0~6000.0 Sec	0.0	

Group 9: Speed Feedback Control Parameters

(A PG Feedback Card (optional) is necessary for setting those parameters)

	Parameters	Functions	Settings	Factory Setting	User
☒	Pr9-00	PG Pulses	1~5000 PPR	1024	
☒	Pr9-01	PG Type and Function setting	0 : Disable PG	0	
			1: Bidirection, Phase A leads in a forward run command and phase B leads in a reverse run command		
			2: Bidirection, Phase B leads in a forward run command and phase A leads in a reverse run command		
			4: As PID feedback (REV)		
			5: As PID feedback (FWD)		
			8: Frequency command (REV) (Pr0-18=4)		
			9: Frequency command (FWD) (Pr0-18=4)		
☒	Pr9-02	PG Speed Feedback Display Filter	0.000~1.000sec	0.03	
	Pr9-03	PG feedback speed control Proportional Gain (P)	0.0~500.0%	20.0	
	Pr9-04	PG feedback speed control Integral Time (I)	0.00~10.00 Sec	0.50	
			0.00 : no integral		
	Pr9-05	PG feedback speed control Differential (D) Time	0.00~5.00 Sec	0.00	
	Pr9-06	PG Speed Control Output Frequency Limit	0.00~150.00Hz	20.00	
	Pr9-07	Treatment of PG Feedback Fault	0: warn and keep operating	0	
			1: warn and RAMP to stop		
			2: warn and COAST to stop		
	Pr9-08	PG Feedback Fault Detection Time	0.00~10.00 Sec	0.10	
	Pr9-09	PG Feedback compensation limit	0~900 RPM	90	

CHAPTER 6 DESCRIPTION OF PARAMETER SETTINGS

The parameters are divided into 10 groups by property for easy setting. In most applications, the user can finish all parameter settings before start-up without the need for re-adjustment during operation.
The 10 groups are as follows:

Group 0: System Parameters	Group 5: Motor Parameters and Protection Parameters
Group 1: Basic Parameters	Group 6: Special Parameters
Group 2: Digital Input/Output Parameters	Group 7: High-function Parameters (PID and Communication)
Group 3: Analog Input/Output Parameters	Group 8: Fan & Pump control parameters
Group 4: Multi-Step Speed Parameters	Group 9: Speed Feedback Control Parameters (To use those parameters an optional speed feedback PG card is necessary)

Symbol to be knew

☒ = This parameter cannot be set during operation.	♦ : Available in Firmware Version 2.xx and after only.	[ ] Parameter no. in Firmware Version 1.xx

Group 0: System Parameters

Pr0-00	**Factory Set**		☒	Factory default	Read only
	Settings	Display according to the model number			
Pr0-01	**Factory Set**		☒	Factory default	Read only
	Settings	Display according to the model number			

These parameters are read-only.

PC1 Series:

200-240V class kW [Hp]	3.7 [5]	5.5 [7.5]	7.5 [10]	11 [15]	15 [20]	18.5 [25]	22 [30]
Rated output current	17	25	33	45	60	73	91
Max. Carrier Frequency	18kHz (10 kHz) ( )Factory default			10kHz (6 kHz)			

Pr0-02	**Parameter Reset (Motor V/F selecting)**		☒	Factory default	8
	Settings	10	Parameter reset for 60Hz, 230V motor application		
		9	Parameter reset for 50Hz, 220V motor application		
		8	Parameter reset for 60Hz, 220V motor application		
		7	Parameter reset for 50Hz, 230V motor application		
		♦ 6	Parameter reset for 60Hz, 240V motor application		
		♦ 5	Parameter reset for 50Hz, 240V motor application		

If users would like to reset the parameters to original Factory default, simply set the parameters to “5”, “6”, “7”, “8”, “9” or “10” according to it’s connected motor. In case you just want to modify the V/F rating to meet the connected motor, user may do it by modifying the Pr1-01 & Pr1-02 only.

Be careful: All parameters (except Password in Pr0-04) which include user modified parameters will be reset to Factory default after this parameter has been executed.

Depress the PROG key and hold for 3 seconds to complete Parameter reset (Firmware version ≥2.04)

Pr0-03	Password Input (The Key)		Factory default	0
	Settings	0~9999		
Pr0-04	**Password set (The Lock)**		Factory default	0
	Settings	0~9999***		

Pr0-03: Allows user to input their password to unlock parameter locking. An incorrect password entered will display an “Err” on the display, alerting user the password is incorrect.

Pr0-04: This parameter allows user to set their password and enable the parameters locking. The same password must be input twice within two minutes.

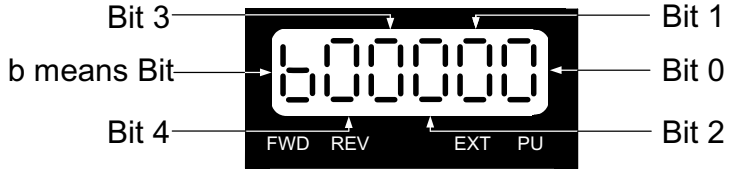
***Once the password is set record it in a safe place. If password is forgotten the drive will have to be sent to factory to Disable the lock.

To verify the status of the Lock check the content of Pr0-04:

The content of Pr0-04	Status of the Lock	What can do?
0	Disabled	Input a non 0 password twice within two minutes from Pr0-04 to enable the lock
1	Enabled	Input the correct password from Pr0-03 to unlock the lock
1 (flashing)	Enabled but Unlocked	Any one of the 3 ways below can re-lock: 1- Input a new non 0 password twice within two minutes from Pr0-04 2- Turn power off and then power on again. 3- Input a wrong password from Pr0-03

To permanently disable the Lock: Enter the correct password from Pr0-03, and then enter 0 into Pr0-04 twice within two minutes.

Pr0-05	Parameter Locking Level			Factory default	b00000
	Settings	**Bit 0**	0	All parameters are readable,	
			1	Those parameters after Pr0-05 are not readable, ”Err” message will be displayed when trying to read.	
		Bit 1	0	Enable Frequency Command changes.	
			1	Disable Frequency Command changes.	
		Bit 2	0	Enable run command from keypad	
			1	Disable run command from keypad	



Pr0-06	Power-up Display Selection		Factory default	0
	Settings	0	Display the frequency command value (F) (Hz)	
		1	Display the actual output frequency (H) (Hz)	
		2	Display the output current (A) (Ampere)	
		3	Multifunction display (U) (display of Pr0-07)	

This parameter allows the start-up display to be customized. The display may still be changed, but during each power on, the display will default to the setting in this parameter.

Pr0-07	Content of Multi-Function Display				Factory default	0
Settings	0	Motor speed (RPM)	1	DC-BUS voltage (Vdc)		
	2	Output voltage (Vac)	3	Output Voltage command (Vac)		
	4	PID feedback signal value (Hz)	5	Multi-step speed running step no.		
	6	Sleep time (Pr8-07)	7	Remaining number of times for the “restart after fault” feature (Pr6-10)		
	8	PID Command frequency (Hz)	9	(Factory Reserved)		
	10	Output Power factor angle (°)	11	Counter value		
	12	Over-torque accumulated time 1 (Pr5-17)	13	(Factory Reserved)		
	14	Dwell Time at Accel. (Pr6-14)	15	Dwell Time at Decel. (Pr6-16)		
	16	DC Braking Time during Start-up (Pr6-01)	17	DC Braking Time during STOP(Pr6-02)		
	18	Remain time of the executing MSS Run	19	(Factory Reserved)		
	20	(Factory Reserved)	21	Accumulated power-up Day (day)		
	22	Accumulated power-up time (hh:mm)	23	(Factory Reserved)		
	24	(Factory Reserved)	25	(Factory Reserved)		
	26	The signal of AVI analog input (Vdc)	27	The signal of ACI analog input (mAdc)		
	28	The signal of AUI analog input (Vdc)	29	(Factory Reserved)		
	30	(Factory Reserved)	31	(Factory Reserved)		
	32~33	(Factory Reserved)	34	Over-torque level 1 (Pr5-16)		
	35	Torque compensation gain 1 (Pr5-01)	36	(Factory Reserved)		
	37	(Factory Reserved)	38	Stall Prevention level (Pr5-12)		
	39	(Factory Reserved)	40~52	(Factory Reserved)		
	53	Output power (kW)	54	Output power (kVA)		
	55	(Factory Reserved)	56	The temperature of IGBT--OH1 (°C)		
	57	The temperature of heat sink--OH2 (°C)	58	(Factory Reserved)		
	59	(Factory Reserved)	60	Overload accumulated time (OL)		
	61	(Factory Reserved)	62	Compensated voltage		
	63	(Factory Reserved)	64	DC Bus voltage upon a fault (Vdc)		
	65	Output voltage upon a fault (Vac)	66	Output frequency upon a fault (Hz)		
	67	OH1 value upon a fault (°C) ♦	68	Output current value upon a fault (Aac)		
	69	OH2 value upon a fault (°C) ♦	70~86	(Factory Reserved)		
	87	DC Bus ripple voltage (Vdc) ♦	88	PG frequency (Hz) ♦		

This parameter defines the display content of the User Defined setting. The User Defined setting may be displayed upon power up (Pr0-06) or by pressing the DISP key on the keypad and scrolling until the “U” is illuminated.

When “0” is set, the motor speed in rpm is an estimated value, if a PG card is not installed. If a PG card is installed the motor speed in rpm is the actual speed.

Pr0-08	User-Defined Coefficient Setting K		Factory default	0
	Settings	0~39 (no use)		
		40~60000 (the corresponding value for Pr1-00-- the max. frequency).		
Pr0-09	Number of the decimal places		Factory default	0
	Settings	0~3		

The coefficient K determines the multiplying factor for the user-defined unit.
The display value is calculated as follows:
U (User-defined unit) = Frequency Command * K (Pr0-08)
H (actual output) = Actual output frequency * K (Pr0-08)

Example 1:
A conveyor belt runs at 16.9m/s at motor speed 60Hz.
K = 16.9/60 = 0.28 (0.281666 rounded to 2 decimals), therefore Pr0-08=0.28
With Frequency command 35Hz, display shows 35*0.23=9.8m/s.
(To increase accuracy, use K=2.82 or K=28.16 and disregard decimal point.)

Example 2:
If using RPM to display the motor speed and the corresponding value to the 4-pole motor 60Hz is 1800. This parameter can be set to 1800 to indicate that the corresponding value for 60Hz is 1800RPM. In case of higher resolution you need to set Pr0-08=18000 and Pr0-09=1 to get 1800.0-RPM readout, 0.1-RPM resolution.

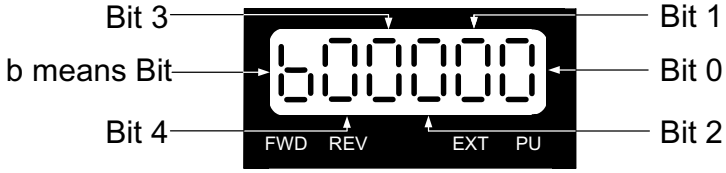
After this parameter is set, all functions relative to the frequency (except for the V/F Curve Frequency parameters) will automatically be changed to an RPM scale. RPM, instead of Hz, will now be the unit for the keypad, and thus, if it is displayed as 60.00 before the setup, it will now display 1800 after the setup. Other parameters such as the multi-step speed and JOG will be automatically changed also.

If the unit is RPS, it can be set to 300 and Pr0-09=1, then get 30.0 RPS readout, 0.1 RPS resolution, to indicate the corresponding value for 60Hz is 30.0 RPS (a decimal point).

Pr0-10	Firmware Version	Factory default	x.xx
	Settings	Read-only	

Pr0-11	EPROM store settings	Factory default	b00000
	Settings	**Bit 0** =1:FWD/REV direction command not memorized	
		Bit 1 =1:PU frequency command not memorized	
		Bit 2 =1:RS-485 frequency command not memorized	
		Bit 3 =1:Up/down frequency command not memorized	
		Bit 4 =1:Changed parameter not memorized	

EEPROM will execute write only when “LU” message displayed after power off.



Pr0-12	Optimal Acceleration / Deceleration Setting			Factory default	0
	Settings	0	Linear acceleration/deceleration (Auto accel./decel. disabled)		
		1	Auto acceleration, linear deceleration		
		2	Linear acceleration, auto deceleration		
		3	Auto acceleration/deceleration		
		4	Linear acceleration/deceleration, but conduct the stall prevention throughout the auto acceleration/deceleration function.		

It can decrease the drive's vibration during load starts and stops by setting this parameter.
During Auto acceleration the torque is automatically measured and the drive will accelerate to the set frequency with the fastest acceleration time and the smoothest start current.
During Auto deceleration, regenerative energy is measured and the motor is smoothly stopped with the fastest deceleration time.

Pr6-08 of Maximum Current Level for Speed Search is regarded as the target of the output current upon auto acceleration.

Auto acceleration/deceleration makes the complicated processes of tuning unnecessary.
It makes operation efficient and saves energy by acceleration without stall and deceleration without brake resistor.

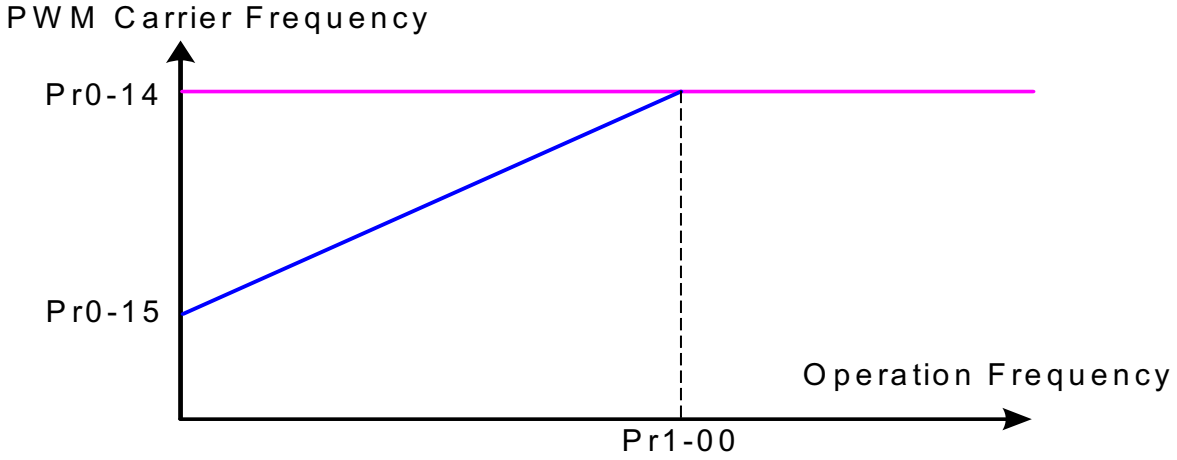
In applications with brake resistor or brake unit, Auto deceleration shall not be used.

Pr0-13	Time unit for Acceleration Deceleration and S curve					
	Settings	0	Unit: 0.01 Sec	☒	Factory default	0
		1	Unit: 0.1 Sec			
		2	Unit: 1 Sec			

This parameter determines the time unit for the Acceleration/Deceleration setting.
This allows the user to choose either high resolution or long acceleration/deceleration time.
Refer to parameters (Pr1-11~Pr1-14), the 1st to the 2nd Acceleration/Deceleration Time, (Pr1-15, Pr1-16) the JOG Acceleration/Deceleration Time and (Pr1-19~Pr1-22) the S Curve Acceleration/Deceleration Time.

Pr0-14	Carrier Frequency Upper Bound		Factory default	10
	Settings	0=0.7kHz		
		1~18kHz		
Pr0-15	Carrier Frequency Lower Bound		Factory default	10
	Settings	0=0.7kHz		
		1~18kHz		

This parameter determines the PWM carrier frequency of the drive.
The adjustable PWM carrier frequency range, are different by model, refer to Table above Pr0-02.



Carrier Frequency Distribution Chart

Carrier Frequency	Acoustic Noise	Electromagnetic Noise	Leakage Current	Heat Dissipation
0.7kHz	Signification	Minimal	Minimal	Minimal
10kHz	↕	↕	↕	↕
18kHz	Minimal	Signification	Signification	Signification

This parameter sets the carrier frequency of PWM output. The Factory default and setting range depends on the model type.

The PWM carrier frequency has a direct effect on the electromagnetic noise of the motor and heat dissipation of the drive. Therefore, if the surrounding noise is higher than the electromagnetic noises of the motor, it is suggested to lower the carrier frequency, to decrease the temperature of the drive. Although a quiet operation may be achieved with a higher carrier frequency, it is necessary to take into consideration the relative wiring length between the motor and drive and the effect this high frequency may have on the motor windings.

If the carrier frequency is lower bound (Pr0-15) > the carrier frequency's upper bound (Pr0-14), then the carrier frequency will be operated at the upper bound level.

When the temperature of the heat sink is greater than its limit, the drive will automatically lower the carrier frequency to avoid over heating the drive.

In most applications, the Low noise mode operation with a higher carrier frequency is satisfactory. In case quiet operation is necessary, please set Pr-0-17 Bit 4=1. But it is necessary to take into consideration that the heat dissipation of the drive will be higher.

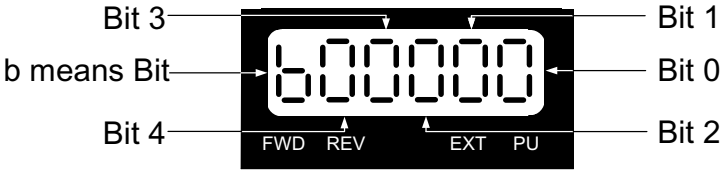
Pr0-16	**Automatic Voltage Regulation (AVR)**		Factory default	0
	Settings	0	AVR function enabled	
		1	AVR function disabled	
		2	AVR function disabled during deceleration	

The rated voltage of the motor is usually 200V/230VAC 50Hz/60Hz and the input voltage of the drive may vary between 180V to 264 VAC 50Hz/60Hz. Therefore, when the drive is used without AVR function, the output voltage will be the same as the input voltage. When the motor runs at

voltages exceeding the rated voltage with 12% - 20%, its lifetime will be shorter and it can be damaged due to high temperature, failing insulation and unstable torque output.
AVR function automatically regulates the drive output voltage to the Motor rated Voltage (Pr1-02). For instance, if Pr1-02 is set at 200 VAC and the input voltage is at 200V to 264VAC, then the Motor rated Voltage will automatically be reduced to a maximum of 200 VAC.

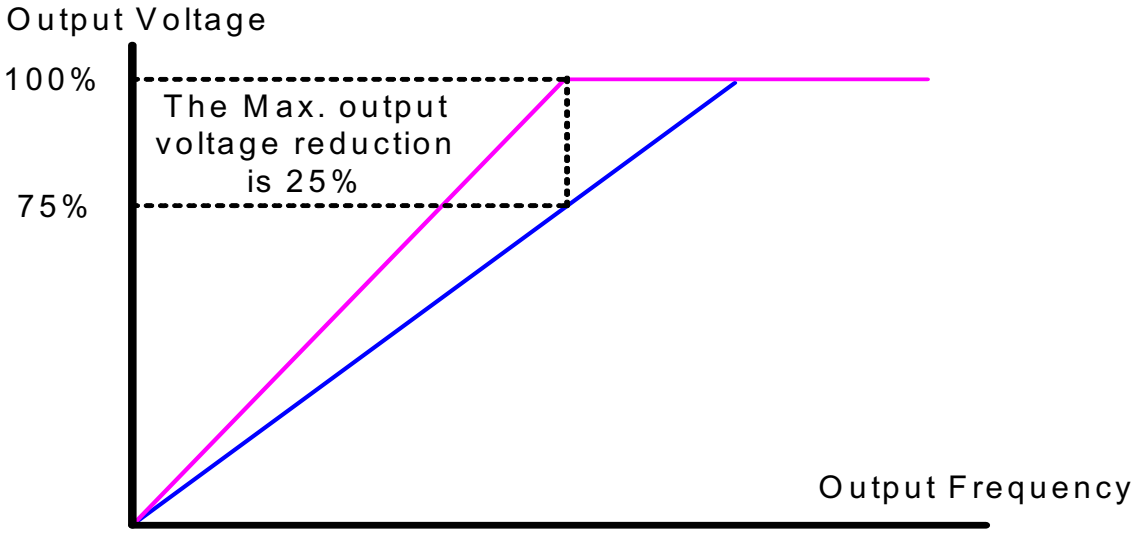
When the motor stops with deceleration, it will shorten deceleration time. When setting this parameter to 2 with auto acceleration/deceleration, it will offer a quicker deceleration.

Pr0-17	Automatic Energy-Saving Operation (AESO) and others				
Settings	Bit0	0	Disable AESO	Factory default	b00000
		1	Enable AESO		
	Bit 1	0	Maximum output voltage could be higher than the source voltage		
		1	Maximum output voltage equals to the source voltage		
	Bit 2	0	General-purpose constant torque application.		
		1	Fan and pump variable torque application .		
	Bit 3	0	Regen torque without slip compensation		
		1	Regen torque with slip compensation		
	Bit 4	0	Low noise mode operation		
		1	Quiet mode operation		



Bit 0

When the Auto Energy-Saving function is enabled, the drive will operate with full voltage during acceleration and deceleration. At constant speed the drive will calculate the optimal output voltage value for the load. It is possible for the output voltage to be 25% below Maximum Output Voltage during auto energy saving operation. This function should not be used with variable loads or continuous rated output loads. During these types of conditions, the operation will cycle on and off, giving poor energy saving results.



Auto Energy-Saving Operation

Bit 1

When “0” is selected, maximum output voltage could be higher than the source voltage (over-modulation available). Good when the power source is AC 220V, but the connected motor is 230V AC. The maximum step up range is 13%.

Bit 2

When “0” is selected, the drive is set to general-purpose constant torque operation.
When “1” is selected, the drive is set to fan and pump variable torque operation.

Bit 3

This parameter determines the slip compensation in a regenerative condition.

Bit 4

Factory default Bit 4=0 is Low noise mode operation, it should meet most applications.
In case absolute quiet operation is necessary, you may set Bit 4=1, but it is necessary to take into consideration that the heat dissipation of the drive will be higher.

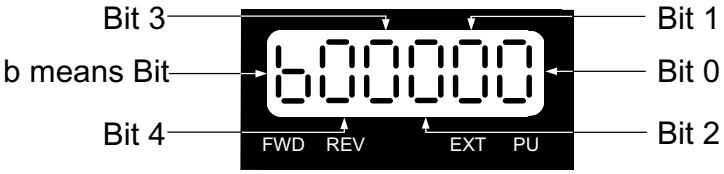
Pr0-18	**Source of the Master Frequency Command**		Factory default	0
	Settings	0	The digital keypad (PU)	
		1	The RS485 communication port	
		2	The external analog signal	
		3	The external up/down terminals (multi-function input terminals)	
		4	The Pulse input (A PG Feedback Card (optional) is necessary.)	

This parameter determines the drive’s master frequency command source.
When this parameter is set to 3 the up/down terminals are enabled.
They can Increase/decrease the Master Frequency each time an input is received or continuously when the input stays active. When both inputs are active at the same time, the Master Frequency increase/decrease is halted. Please refer to Pr2-07, Pr2-08 for more detail. This function is also called “motor potentiometer”.
When this parameter is set to 4, then the master frequency = Input pulse frequency/Pr9-00 Refer to Pr9-00 and Pr9-01 for detail.

Pr0-19	**Source of the Operation Command**		Factory default	0
	Settings	0	RS485 serial communication or Digital keypad (PU)	
		1	External terminals or Digital keypad (PU)	
		2	Digital keypad (PU)	
		3	External terminals	

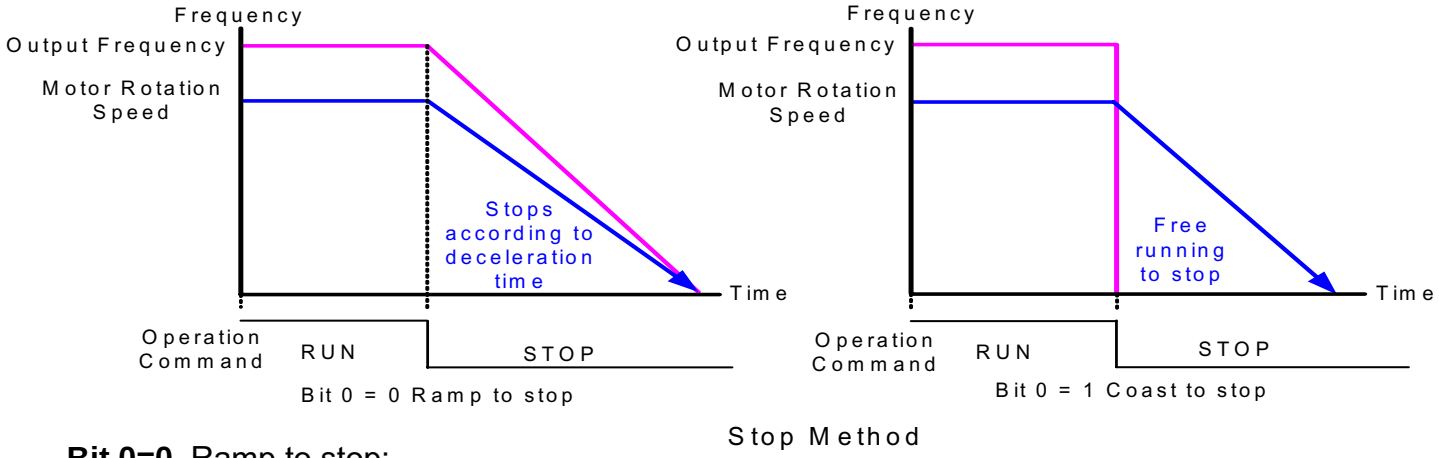
This parameter determines the drive’s operation command source.
When set to 0 or 1, the operation command source may be switched via the PU key on the digital keypad (PU). When the PU LED is lit, the operation command is from the digital keypad.
When the operation command is from an external terminal, please refer to Pr2-00, Pr2-07 and Pr0-20 for details.

Pr0-20	Stop Methods and Run safety lockout		Factory default	b00000
	Settings	**Bit0**	0	Ramp to stop
			1	Coast to stop
		Bit1	0	Will Not Restart after reset
			1	Restart after reset
		Bit2	0	Line Start Lockout is enabled
			1	Line Start Lockout is disabled
		Bit3	0	The transition between FWD/REV going through 0 point
			1	The transition between FWD/REV not going through 0 point
		Bit4	0	linear accel and decel at high speed zone
			1	S-curve accel and decel at high speed zone



Bit 0: Stop Method

1-The parameter determines how the motor is stopped when the drive receives a valid stop Command or an External Fault detected.



Stop Method

Bit 0=0 Ramp to stop:

The drive will ramp down from running frequency to 0Hz or to startup frequency (Pr1-08) or to output Frequency Lower Limit (Pr1-10) according to the deceleration time and then stops.

Bit 0=1 Coast to stop:

The drive will stop the output instantly upon a STOP command and the motor will coast to stop according to its inertia (time unknown).

The motor stop method is usually determined by the characteristics of the motor load and how frequently it is stopped.

- It is recommended to use “ramp to stop” for safety of personnel or to prevent material from being wasted in applications where the motor has to stop after the drive is stopped. The deceleration time has to be set accordingly.
- If motor free running is allowed or the load inertia is large, it is recommended to select “coast to stop”. For example: Fan, blowers, punching machines, centrifuges and pumps.

Bit 1 : Safety lockout after reset

Bit 1=0 After the error of the drive is eliminated, the drive will not restart after reset

Bit 1=1 After the error of the drive is eliminated, the drive will restart after reset

Bit 2 : Line Start Lockout

This is a safety feature when the operation command source is from an external terminal and operation command is ON (FWD/REV-DCM=close), the drive will operate according to the setting of Bit 2 after power is applied. **<For terminals FWD and REV only>**

Bit 2=0 : Line Start Lockout is enabled

The drive will not start when powered up with a run command applied, until operation command is received after previous operation command is cancelled.

Bit 2=1 : Line Start Lockout is disabled (also known as Auto-Start)

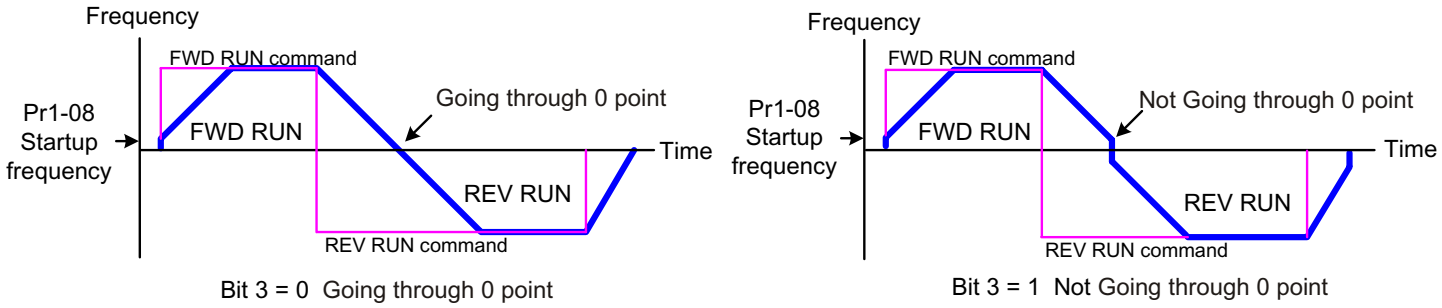
The drive will start when powered-up with run commands applied.

The Line Start Lockout feature does not guarantee the motor will never start under this condition. It is possible the motor may be set in motion by a malfunctioning switch.

Bit 3 : The transition mode between Forward and Reverse

Bit 3=0 Forward and Reverse going through 0 point

Bit 3=1 Forward and Reverse not going through 0 point

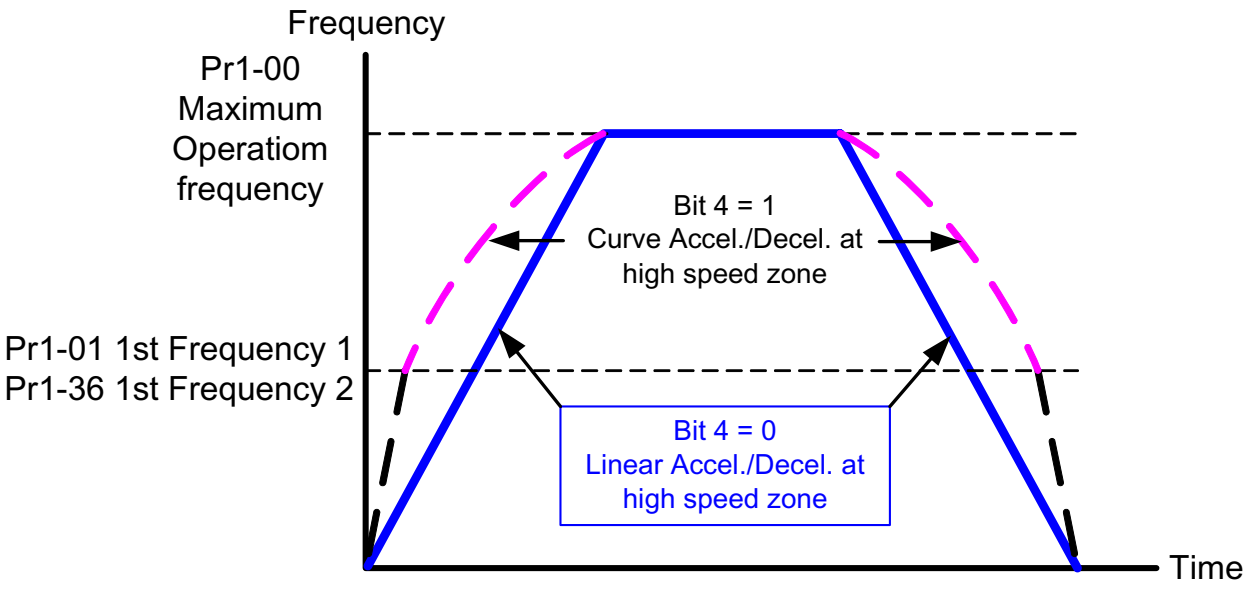


Transition mode between Forward & Reverse

This parameter selects the transition mode between Forward and Reverse. By going through the 0 point, there will be a short time where the motor has not flux and very little power.

It is recommended for all non-horizontal movement to choose “not going through the 0 point”

Bit 4 :



Pr0-21	Reverse Operation		Factory default	0
	Settings	0	Enable Forward/Reverse operation	
		1	Disable Reverse operation	
		2	Disable Forward operation	

This parameter disables the drive's ability to run in a certain direction. It may be used to prevent a motor from running in a direction that would consequently injure humans or damage the equipment. See Chapter 3-6 for definition of direction of rotation.

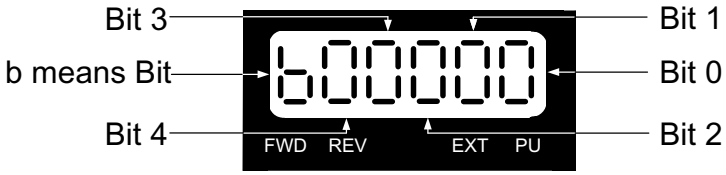
Pr0-22	Timer After stopped		Factory default	0.00
	Settings	0.00~60.00sec		

This parameter is used to set the wait time for restarting after a stop.

Pr0-23	Fan control		Factory default	b00000
	Settings	Bit 0=0:when power is applied, the fan will turn on		
		Bit 0=1:When the run command is given, the fan will turn on		

This parameter determines the operation mode of cooling fan.

When Bit 0=1, It will reduce the fan noise when drive is stopped, and also extend fan's life.



Pr0-24	Frequency setting resolution of Fly-shuttle dial on PU			
	Settings	0=0.01 Hz	Factory default	1
		1=0.10Hz		
		2=1.00Hz		
		3=10.00 Hz		

This provides frequency resolution increment setting via the Fly-shuttle dial on PU.

Pr0-25	Parameter Team selection	☒	Factory default	0	♦
	Settings	0: Team A			
		1: Team B			
		2: Select Team A or Team B by MI3			

This drive provides 2 parameter Teams, user may pre-set 2 different parameter Teams.

The drive can only execute one of the 2 parameter Teams at a time.

When executing a Parameter Reset (Pr0-02), it will only reset the selected Parameter Team.

When Pr0-25 = 2, Pr2-03 will be forced to a '0' and disable its original function. Then user may select Team A or Team B from MI3 terminal. (When MI3 is enabled Team B is selected).

Pr0-00~ Pr0-04 and Pr0-25 are same for both Team A and Team B.

Team selection can only be done when the drive is stopped.

Group 1: Basic Parameters

Pr1-00	Maximum Operation Frequency		☒
	Settings	50.0~600.00Hz	Factory default	60.00/50.00

This parameter determines the drive Maximum Operation Frequency.
All master frequency commands set by the keypad or analog inputs are limited by this parameter. All the frequency command sources (analog inputs 0 to +10V, 4 to 20mA and -10V to +10V) are scaled to correspond to the output frequency range.

Pr1-01	1st Frequency Setting 1 (Base Frequency) (FBASE 1)		☒
	Settings	0.00~600.00 Hz	Factory default	60.00/50.00

This value should be set according to the rated frequency of the motor as indicated on the motor nameplate and also called the base frequency.
This parameter determines the v/f curve ratio. For example, if the drive is rated for 230 VAC output and the 1st Frequency Setting 1 is set to 60Hz, the drive will maintain a constant ratio of 3.83 V/Hz (230V/60Hz=3.83V/Hz).

Pr1-02	1st Voltage Setting 1 (Motor rated voltage) (VBASE 1)		Setting resolution	0.1
230V models	Settings	0.0~255.0V	Factory default	230.0 *

This parameter determines the 1st Voltage Setting 1 of the drive. The set value must be smaller than or equal to the rated voltage of the motor as indicated on the motor nameplate.
There are many motor types in the market and different power system's for each country
The economic and convent method to solve this problem is to install an AC drive.
There is no problem using a motor with a different voltage and frequency than line voltage and frequency, by matching the drives output to the motors characteristics.

* These parameters Pr1-02 and Pr1-0 will be adjusted by default, according to Pr0-02 setting

Pr1-03	2nd Frequency Setting 1 (Middle Frequency 1) (FMID 1)	☒	Factory default	0.50
	Settings	0.00~600.00 Hz		
Pr1-04	2nd Voltage Setting 1 (Middle Voltage 1) (VMID 1)		Setting resolution	0.1
230V models	Settings	0.0~255.0V	Factory default	5.0

These two parameters set the Mid-Point Frequency and Voltage of any V/F curve.

Pr1-05	3rd Frequency Setting 1 (Low-point Frequency 1) (FLOW 1)	☒	Factory default	0.50
	Settings	0.00~600.00 Hz		
Pr1-06	**3rd Voltage Setting 1 (Low-point Voltage 1) (VLOW 1)**		Setting resolution	0.1
230V models	Settings	0.0~255.0V	Factory default	5.0

These two parameters set the low-point Frequency and Voltage of any V/F curve.

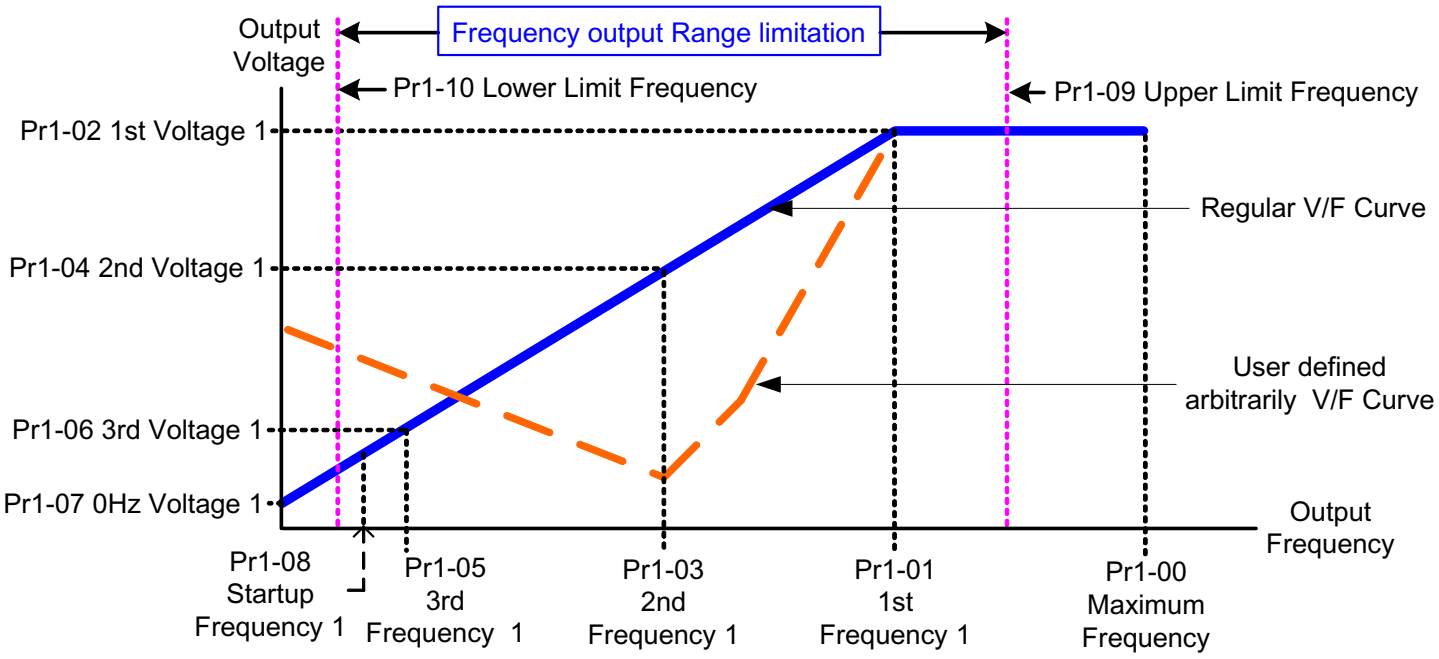
Pr1-07	0Hz Output Voltage Setting 1 (V0Hz 1)		Setting resolution	0.1
230V models	Settings	0.0~255.0V	Factory default	0.0

V/f curve setting is usually set by the motor's allowable loading characteristics. Pay special attention to the motor's heat dissipation, dynamic balance, and bearing lubricity, if the loading characteristics exceed the loading limit of the motor.

For the V/F 1 curve setting, it should be Pr1-01≥ Pr1-03≥ Pr1-05≥ Pr1-08. There is no limit for the voltage setting, but a high voltage at the low frequency may cause motor damage, overheat, stall prevention or over-current protection. Therefore, please use the lowest voltage at the low frequency to prevent motor damage.

Parameters Pr1-01~Pr1-07 are for the 1st V/F curve setting (V/F 1), and Pr5-00~Pr5-04 are its Relative motor parameters.

Parameters Pr1-36~Pr1-42 are for the 2nd V/F curve setting (V/F 2), and Pr5-40~Pr5-44 are its Relative motor parameters.



V/F Curve 1

Pr1-08	Startup Frequency	Factory default	0.50
	Settings	0.00~600.00 Hz	

The Start-up Frequency is the initial frequency output upon a RUN command. If the startup frequency setting is higher than the Maximum Operation Frequency (Pr1-00), the drive will default to Pr1-00 as the start point.

When the Pr6-11 (The speed search function) is enabled Pr1-08 (Start-up frequency) was disabled.

Pr1-09	Output Frequency Upper Limit	Factory default	110.0
	Settings	0.0~150.0% of Maximum Operation Frequency (Pr1-00)	
Pr1-10	Output Frequency Lower Limit	Factory default	0.0
	Settings	0.0~100.0% of Maximum Operation Frequency (Pr1-00)	

Calculation: Upper Limit Frequency (Hz)= (Pr1-00×Pr1-09)÷100,
Lower Limit Frequency (Hz)= (Pr1-00×Pr1-10)÷100

The Upper/Lower Limits are to prevent operation errors and machine damage.

These parameters set the upper and Lower limit of the output frequency. If the command frequency is lower than the Start-up frequency, the motor will be operating at Zero speed.

If the command frequency is lower than the Lower limit frequency, the motor will be operating at Lower limit frequency; if the command frequency is higher than the Upper limit frequency, the motor will then operate at the Upper limit frequency.

This function is disabled if the Lower limit > the Upper limit.

Pr1-11	Acceleration Time 1	Factory default	10.00/60.00
Pr1-12	Deceleration Time 1	Factory default	10.00/60.00
Pr1-13	Acceleration Time 2	Factory default	10.00/60.00
Pr1-14	Deceleration Time 2	Factory default	10.00/60.00
Pr1-15	JOG Acceleration Time	Factory default	10.00/60.00
Pr1-16	JOG Deceleration Time	Factory default	10.00/60.00
	Settings	0.00~60000 Sec	

The Acceleration time is the time required for the drive to ramp from 0 Hz to its Maximum Operation Frequency (Pr1-00).

The Deceleration time is the time required for the drive to decelerate from Maximum Operation Frequency (Pr1-00) down to 0 Hz.

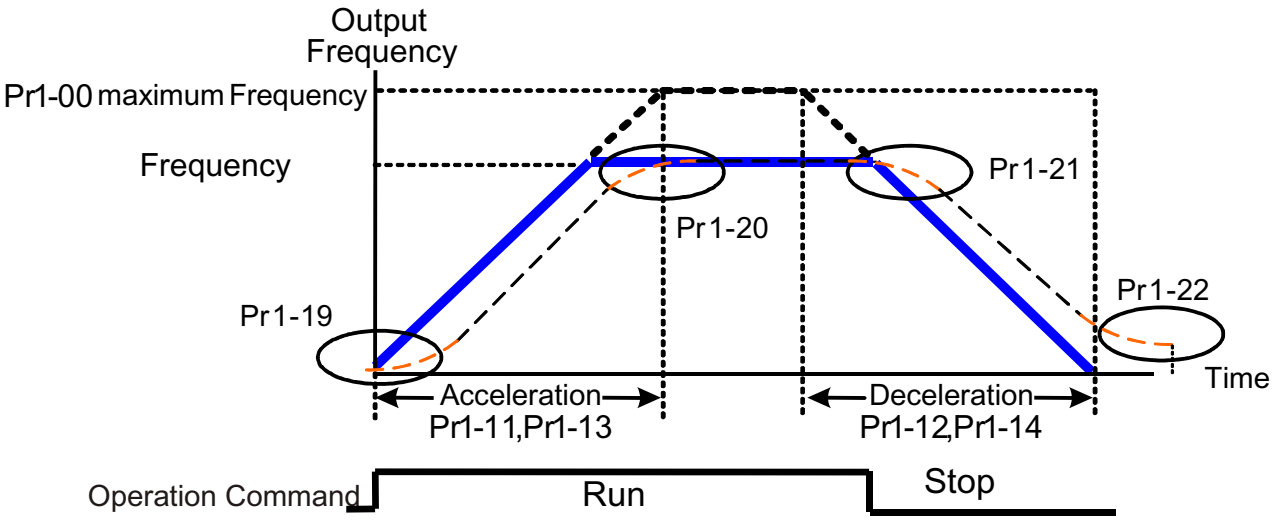
The rate is linear unless S-Curve is “Enabled”, see Pr1-19~Pr1-22

The Acceleration/Deceleration Time 1, 2, are selected according to the Multi-Function Input Terminal Settings or by Output frequency. See Pr2-01 to Pr2-06 and Pr1-18 for more details

An Acceleration or Deceleration time that is too fast may trigger the drives protection function (over-current stall prevention during Accel Pr5-10 or over-voltage stall prevention Pr5-07). If this occurs, the actual Accel/Decel time will be longer than this setting.

The acceleration/deceleration times will be disabled if Pr0-12 is set for automatic operation.

An acceleration or deceleration that is too fast, may cause excessive load on the drive and may permanently damage the drive. If you want to decelerate the drive in short time period, we recommend adding an external Dynamic Braking Unit and braking resistor.



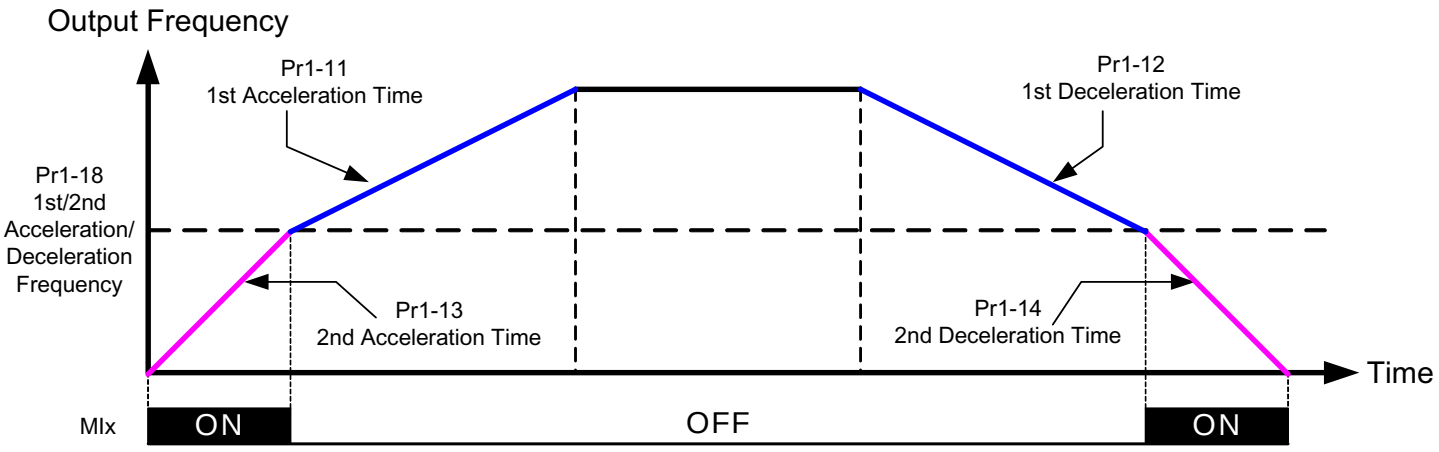
Definition of the Acceleration /Deceleration Time

Pr1-17	JOG Frequency	Factory default	6.00
	Settings	0.00~600.00 Hz	

This parameter determines the Jog frequency. The Jog function may be selected by the JOG key on the PU or the external terminals. When the drive is under a RUN command, the JOG operation is disabled. Likewise the drive will not accept a RUN command while the JOG command is enabled but the Fwd/Rev and Stop command from the digital keypad(PU).

Pr1-18	1st/2nd Acceleration/Deceleration Frequency			
	Settings	0.00~600.00 Hz	Factory default	0.000

This function can be used to switch between acceleration/ deceleration time 1 and acceleration/deceleration time 2 without an external switch. But the external multi-function terminals have the highest priority when using with external terminals.



1st/2nd Accerleration/Deceleration Switching

Pr1-19	**S-Curve for Acceleration Departure Time**	Factory default	0.00
Pr1-20	**S-Curve for Acceleration Arrival Time**	Factory default	0.00
Pr1-21	**S-Curve for Deceleration Departure Time**	Factory default	0.00
Pr1-22	**S-Curve for Deceleration Arrival Time**	Factory default	0.00
	Settings	0.00~12000 Sec	

This parameter determines the S curve strength. A large S curve time will give the smoothest transition between speed changes. Please note the S curve settings increase the actual acceleration/deceleration times as follows:

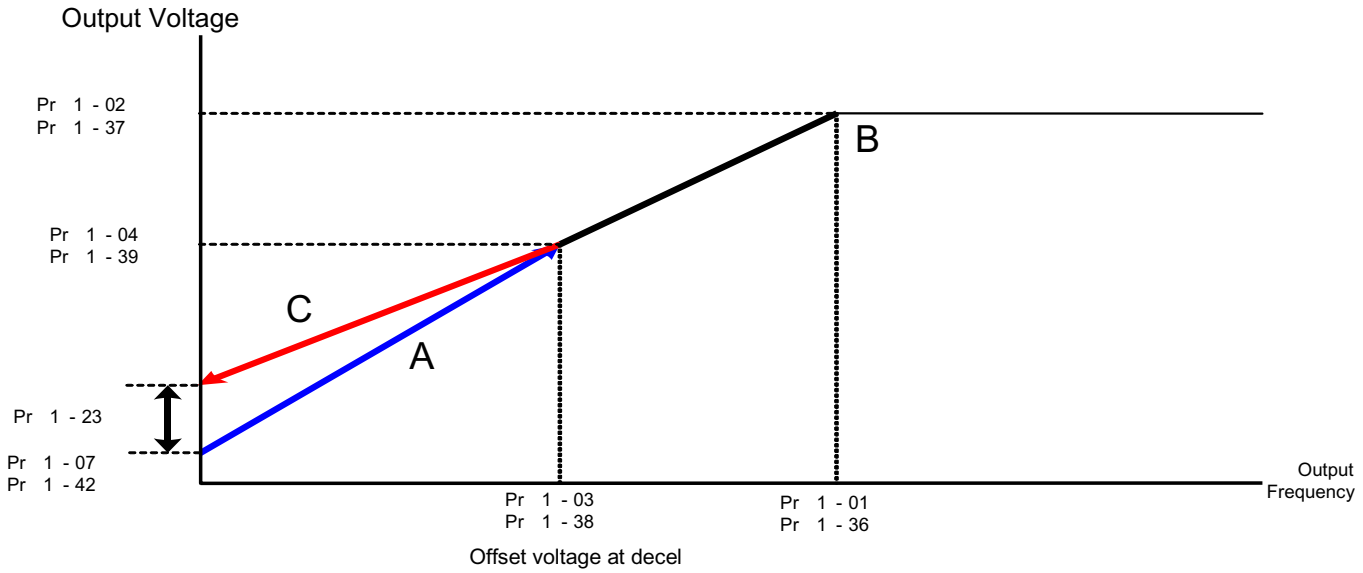
Actual acceleration time = selected accel. Time (Pr1-11)+(Pr1-19+Pr1-20)/2

Actual deceleration time = selected decel. Time (Pr1-12) +(Pr1-21+Pr1-22)/2

The S curve is disabled when Optimal Acceleration / Deceleration is enable or Acceleration Deceleration times are set to 0.

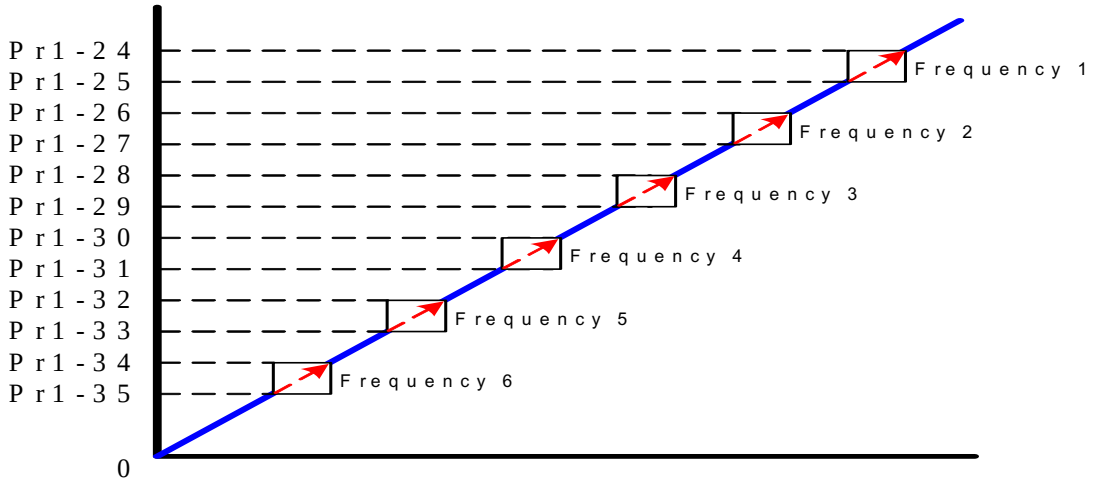
Pr1-23	[Pr1-29]	**Offset voltage at decel**		
230V models	Settings:-50.0~50.0 V		Factory default	0.0

Accel route is A - B. Decel route is B - C. This parameter can be used when different torques are needed between accel and decel.



Pr1-24	[Pr1-23]	**Skip Frequency 1 upper limit**	☒	Factory default	0.00
Pr1-25	[Pr1-24]	**Skip Frequency 1 lower limit**	☒	Factory default	0.00
Pr1-26	[Pr1-25]	**Skip Frequency 2 upper limit**	☒	Factory default	0.00
Pr1-27	[Pr1-26]	**Skip Frequency 2 lower limit**	☒	Factory default	0.00
Pr1-28	[Pr1-27]	**Skip Frequency 3 upper limit**	☒	Factory default	0.00
Pr1-29	[Pr1-28]	**Skip Frequency 3 lower limit**	☒	Factory default	0.00

Pr1-30	♦	**Skip Frequency 4 upper limit**	☒	Factory default	0.00
Pr1-31	♦	**Skip Frequency 4 lower limit**	☒	Factory default	0.00
Pr1-32	♦	**Skip Frequency 5 upper limit**	☒	Factory default	0.00
Pr1-33	♦	**Skip Frequency 5 lower limit**	☒	Factory default	0.00
Pr1-34	♦	**Skip Frequency 6 upper limit**	☒	Factory default	0.00
Pr1-35	♦	**Skip Frequency 6 lower limit**	☒	Factory default	0.00
	Settings	0.00~600.00 Hz			



These parameters are used to set the skip frequency of the drive.
The Skip Frequencies are useful when a motor has vibration at a specific frequency bandwidth, by skipping this frequency, the vibration will be avoided.

The Skip frequency will be disabled if this rule is not followed, please use the following hierarchy when setting these parameters:
Pr1-24≥Pr1-25≥Pr1-26≥Pr1-27≥Pr1-28≥Pr1-29≥Pr1-30≥Pr1-31≥Pr1-32≥Pr1-33≥Pr1-34≥Pr1-35

Pr1-36	**1st Frequency Setting 2 (Base Frequency) (FBASE 2)**			♦
☒	Settings	0.00~600.00 Hz	Factory default	60.00/50.00

This parameter is the same as Pr1-01

Pr1-37	**1st Voltage Setting 2 (Motor rated voltage) (VBASE 2)**		♦	Setting resolution	0.1
230V models	Settings	0.0~255.0V		Factory default	230.0

This parameter is the same as Pr1-02

Pr1-38	**2nd Frequency Setting 2 (Middle Frequency 2) (FMID 2)**	♦	Factory default	0.50
☒	Settings	0.00~600.00 Hz		

Pr1-39	2nd Voltage Setting 2 (Middle Voltage 2) (VMID 2)	♦	Setting resolution	0.1
230V models	Settings	0.0~255.0V	Factory default	5.0

This parameter is the same as Pr1-03, Pr1-04

Pr1-40	3rd Frequency Setting 2 (Low-point Frequency 2) (FLOW 2)	♦	Factory default	0.50
☒	Settings	0.00~600.00 Hz		

Pr1-41	3rd Voltage Setting 2 (Low-point Voltage 2) (VLOW 2)	♦	Setting resolution	0.1
230V models	Settings	0.0~255.0V	Factory default	5.0

This parameter is the same as Pr1-05, Pr1-06

Pr1-42	0Hz Output Voltage Setting 2 (V0Hz 2)	♦	Setting resolution	0.1
230V models	Settings	0.0~255.0V	Factory default	0.0

This parameter is the same as Pr1-07

For the V/F 2 curve setting, it should be Pr1-36≥ Pr1-38≥ Pr1-40≥ Pr1-08.

Parameters Pr1-01~Pr1-07 are for 1st V/F curve setting, Pr5-00~Pr5-04 are motor 1 parameters.

Parameters Pr1-36~Pr1-42 are for 2nd V/F curve setting, Pr5-40~Pr5-44 are motor 2 parameters.

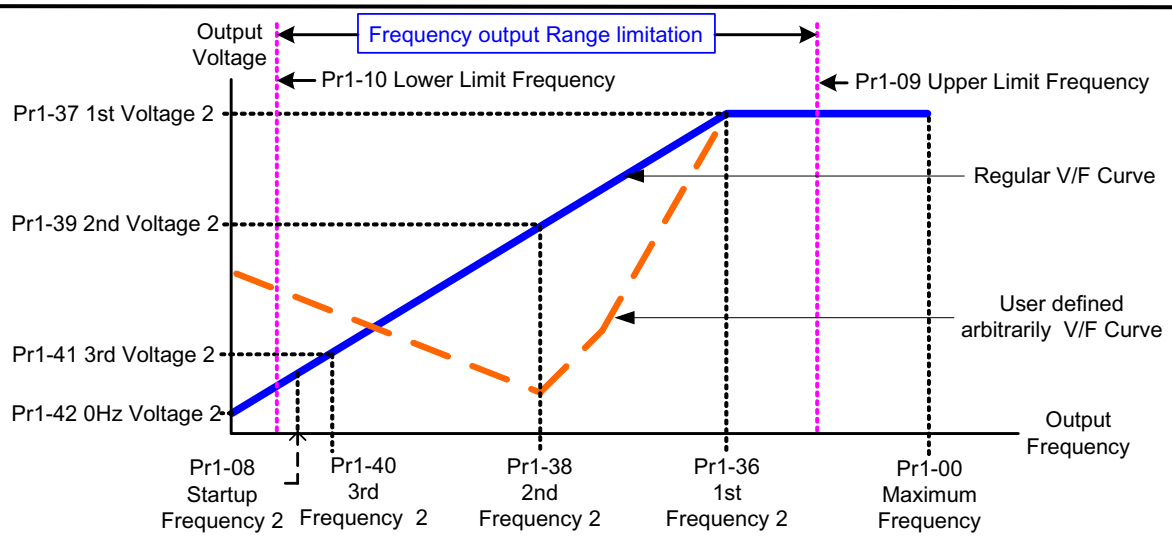
By using Pr5-48, Pr5-49 and setting the parameters as below:

1-Set the MIx terminal (Pr2-01~Pr2-06) to 42—As a Motor selection command

2-Set the MIx terminal (Pr2-01~Pr2-06) to 43—As a Confirm signal of Motor selection

3-Set the MOx terminal (Pr2-20~Pr2-2) to 32—As a Motor selection output

Then user may execute Motor selection and switch VF1 to VF 2 and its relative motor parameters refer to Pr5-48, Pr5-49.



V/F Curve 2

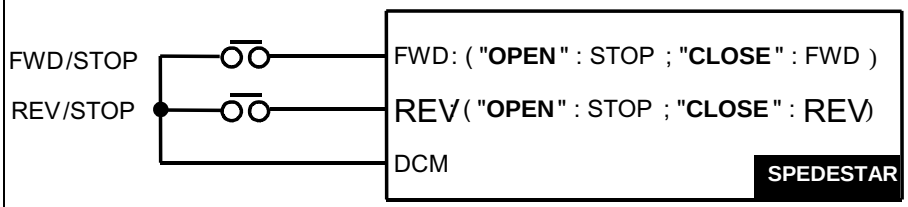
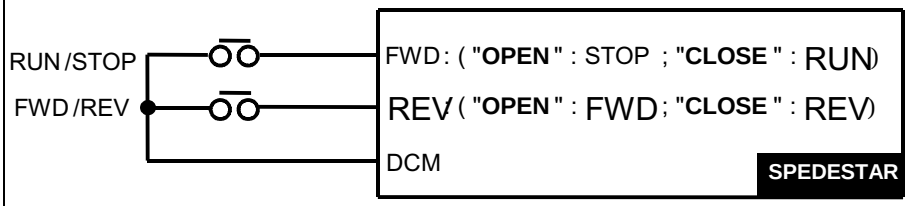
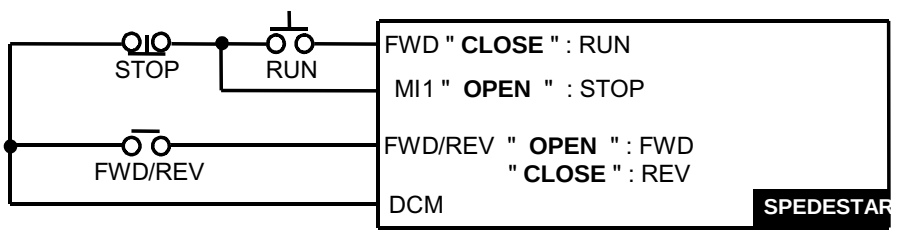
Group 2: Digital Input/Output Parameters

Pr2-00	2-Wire/3-Wire Operation Control	☒	Factory default	0
	Settings	0	2-wire operation control (1): FWD/STOP, REV/STOP	
		1	2-wire operation control (2): RUN/STOP, REV/FWD	
		2	3-wire Operation (momentary push button)	

When Pr0-19 = 3, the operation command is from the external terminals. This parameter is to set the operation control mode, the drive offers three types of external operation control.

For “Line Start Lockout” setting, please refer to Pr0-20,
For “Edge Trigger/Level Trigger” setting, please refer to Pr2-07

When 3-wire operation control is selected, the stop signal (between MI1 and DCM) must be a normally closed connection.

Pr2-00		Control Circuits of the External Terminal
0	2-wire operation control (1) **FWD/STOP REV/STOP**	
1	2-wire operation control (2) **RUN/STOP REV/ FWD**	
2	3-wire operation control (momentary push button)	

Pr2-01	**Multi-Function Digital Input Command 1 (MI1)**	☒	Factory default	1
Pr2-02	**Multi-Function Digital Input Command 2 (MI2)**	☒	Factory default	2
Pr2-03	**Multi-Function Digital Input Command 3 (MI3)**	☒	Factory default	3
Pr2-04	**Multi-Function Digital Input Command 4 (MI4)**	☒	Factory default	4
Pr2-05	**Multi-Function Digital Input Command 5 (MI5)**	☒	Factory default	5
Pr2-06	**Multi-Function Digital Input Command 6 (MI6)**	☒	Factory default	14

This parameter selects the functions for each multi-function digital Input terminal.

When Pr2-00 is set to 3-wire operation control. Terminal MI1 is needed for the third wire position. Therefore MI1 is not allowed for any other operation.

When Pr0-25=2, Pr2-03 will be forced to a '0' and disable its original function. Then user may select Team A or Team B from MI3 terminal. (When MI3 is enabled Team B is selected).

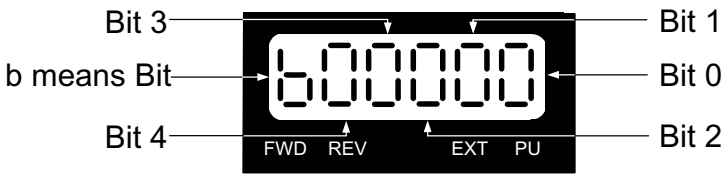
List of the Multi-Functions

Setting	Functions	Explanations
0	No definition	Any unused terminals should be programmed to 0 to insure they have no effect on operation. When Pr0-25=2, the Pr2-03 will be forced to '0'.
1	Multi-step speed command 1	15 step speeds could be conducted through the digital statuses of the 4 terminals, and 17 in total if the master speed and JOG are included. (Refer to Pr4-00~04-14)
2	Multi-step speed command 2	
3	Multi-step speed command 3	
4	Multi-step speed command 4	
5	External Reset (NO)	After the error of the drive is eliminated, use this terminal to reset the drive
6	Clear counter	When this function is enabled, it will clear current counter value and display "0". Only when this function is disabled, it will keep counting upward.
7	The 1st, 2nd acceleration/ deceleration time selection	The acceleration/deceleration time of the drive could be selected from this function or the digital statuses of the terminals; there are 2 acceleration/ deceleration speeds in total for selection.
8	Acceleration/deceleration speed inhibit	When this function is enabled, acceleration and deceleration is stopped and the drive maintains a constant speed. The drive starts to accel./decel. from the inhibit point after this command is removed
9	Frequency command from AVI	When this function is enabled, the source of the Frequency will be forced to be AVI.
10	Frequency command from ACI	When this function is enabled, the source of the Frequency will be forced to be ACI.
11	Frequency command from AUI	When this function is enabled, the source of the Frequency will be forced to be AUI.
12	Emergency Ramp Stop	When this function is enabled, the drive will ramp to a stop. This function is the same as the "STOP" command. But won't display any error message. After this terminal is disabled, you need to press "RUN" or re-issue a run command, to start the drive.
13	PID function disabled	When this setting is enabled, PID feedback control function will be disabled. drive will operate via Master Frequency Command source(Pr0-18).

14	EF input (External fault input terminal)	When the drive receives a signal of malfunction, it will emergency coast to stop and generate an external fault (EF). Please press “RESET” after fault has been cleared. (it will have EF fault code recorded)
15	B.B. traces from the bottom upward	When this function is enabled, output of the drive will be cut off immediately, and the motor will then be of the B.B. status. And once the ON/OFF function is restored, the drive will then trace from the bottom upward/from the top downward to catch up with its mutual rotation speed with the same frequency before B.B., then speed up to the pre-set frequency. Even if the motor is of a complete stop after B.B., as long as the ON/OFF status is restored , the speed-tracing function could still be operated.
16	B.B. traces from the top downward	
17	Operation command from External terminal.	When this function is enabled, the Operation Command Source will be forced to External terminal. Pr0-19 will automatically be disabled once this function is enabled.
18	Cancel the setting of the optimal acceleration/ deceleration time	Before using this function, Pr0-12 should be set to 1 or 2 or 3 or 4.When this function is enabled, the optimal acceleration/ deceleration setting will be disabled, Then the drive will accel/decel in linear mode.
19	FWD JOG command	FWD JOG operation, Neglect the existing direction command
20	REV JOG command	REV JOG operation, Neglect the existing direction command
21	JOG command	JOG operation. Enables the JOG command. Works identical to the JOG key on the digital keypad. Jog operation can only be done while the motor is stopped. (Refer to parameter Pr1-15~Pr1-17)
22	Cancel PLC Run	To cancel PLC Run program. When this function is enabled, the running PLC Run will be stopped. When PLC Run command is enabled again, drive will execute PLC Run from the start point. No need to “RESET” after canceling PLC Run.
23	Pause PLC Run	To pause PLC Run program and Pr4-35. When this function is enabled, the running PLC Run or Pr4-35 will be paused. When this Pause command is removed, the drive will continue to execute PLC Run program from the **paused point** with PLC Run commands applied. This function is valid for all PLC Run steps and Pr4-35.
24	Digital Up command	Increase/decrease the Master Frequency each time an input is received or continuously when the input stays active. When both inputs are active at the same time, the Master Frequency increase/decrease is halted. Please refer to Refer to Pr0-18, Pr2-07, Pr2-08. This function is also called “motor potentiometer”.
25	Digital Down command	
26	Zero speed is replaced by DC braking	It is a DC braking command at 0Hz speed and it is valid during run. It is used to improve vibration by using DC mode at zero speed when drive is not matched with motor or parameter setting of motor is not well suited. Refer to Pr6-00

27	Pause	When this function is enabled, drive will ramp to a stop. It won't display any error message. After this terminal is disabled, the drive will restart with a run command applied. This function may be used to Pause PLC Run different from "23 " Pause PLC Run. The difference is: When this function is enabled during drive executing Pr4-35, after this Pause command is removed, drive will continue to execute PLC Run program from the **start point** with PLC Run commands applied.
28	Disable Dwell function	When this setting is enabled, Dwell function is disabled Refer to Pr6-14~ Pr6-18
29	Disable traverse function	When this setting is enabled, traverse function is disabled Refer to Pr6-19 , Pr6-20
30	Disable Speed Search during Start-up	When this setting is enabled, Speed Search during Start-up function is disabled. Refer to Pr6-11
31	EEPROM write function disable	When this setting is enabled, EEPROM write function is disabled.
32	Counter Trigger (MI2 terminal only)	This is setting MI2 to be the Trigger input to increment the drive's internal counter. when an input is received, the counter is incremented by 1.
♦42	Motor Selection	When this function is enabled, the drive will start to switch to operate under V/F 2 curve and motor 2 parameters. (The drive is operating under V/F 1 curve and motor 1 parameters when this function is disabled)
♦43	Confirm signal of Motor selection	When this function is enabled, the drive will be ready to operate under V/F 2 curve and motor 2 parameters.

Pr2-07	**The Acceleration /Deceleration mode of the UP/DOWN command**		Factory default	b00000
	Settings	**Bit 0**	0	Up command, drive accel according to Accel time
			1	Up command, drive accel according to Pr2-08 setting
		Bit 1	0	Down command, drive decel according to Decel time
			1	Down command, drive decel according to Pr2-08 setting
		Bit 2	0	(Factory Reserved)
			1	
		♦ Bit 3	0	FWD/REV terminals action by Edge Trigger
			1	FWD/REV terminals action by Level Trigger
		♦ Bit 4	0	PG feed-back over compensation during Accel is allowed
			1	PG feed-back over compensation during Accel is not allowed



Bit 0 and Bit 1 and Pr2-08 determine the Accel/Decel rate of Up/Down command.

Bit 3=0 (Edge Trigger): Once the drive has tripped or is re-powered on after power interruption, a run command must be re-applied to run the drive .

Bit 3=1 (Level Trigger) : Once the drive has tripped or is re-powered on after power interruption, the drive will run with an existing run command.

Pr2-08	The specific Acceleration /Deceleration of the UP/DOWN command		Factory default	0.01
	Settings	0.01~1.00Hz/msec		

These parameters determine the specific accel/decal rate of Up/Down command.

Pr2-09	Digital Input Terminal Debouncing Time		Factory default	0.005
	Settings	0.001~30.000 Sec		

This parameter is to delay or confirm the message of the digital input terminals; the delayed time is the confirmation time, which will be helpful in preventing some uncertain interferences that would consequently result in erroneous motions (except for the counter input) in the input of the digital terminals (FWD, REV, and MI1~6), and under this condition, confirmation for this parameter could be improved effectively, but the responding time will be somewhat delayed. The delay time is to de-bounce noisy signals that could cause the digital terminals to malfunction.

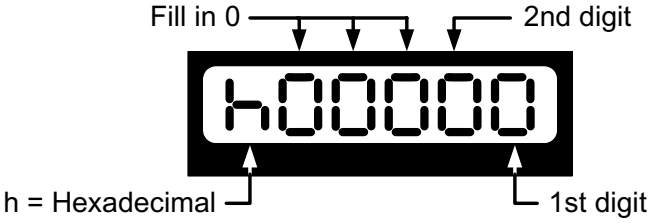
Pr2-10	Digital Input terminals status select		Factory default	h00000
	Settings	00000~000FF		
		0=Short circuit active 1=Open circuit active		

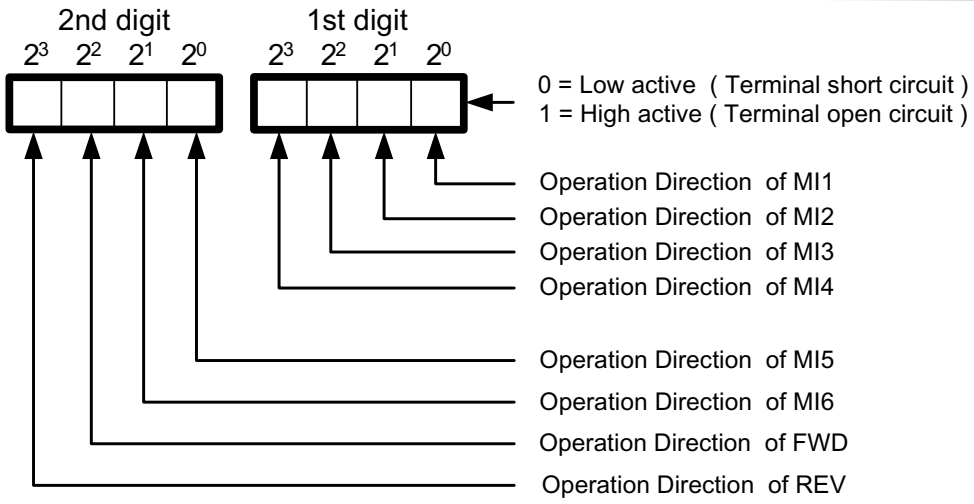
This parameter is used to set the status of the digital terminals (FWD, REV, and MI1~6). (N.O./N.C.) and it won't be affected by the Sink/Source status.

The MI1 setting will be invalid when the operation command source is set to external terminal (3-wire). User can change terminal status via RS-485 communication.

Refer to 3-1 wiring diagram for more detail about Sink/Source switch

The Setting method: It needs to convert binary number (8-bit) to Hexadecimal for input.

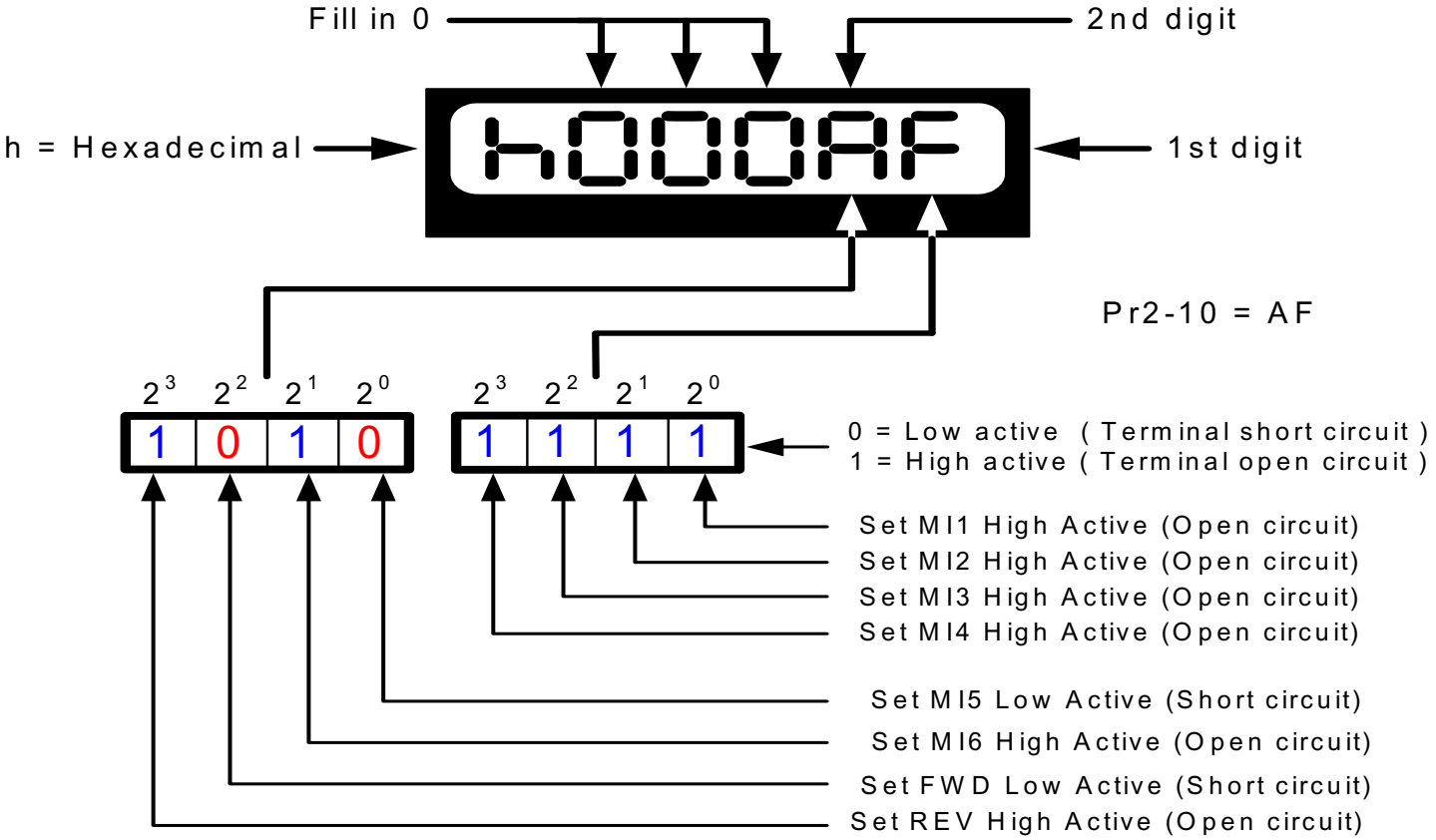




Conversion table between Decimal and Hexadecimal

Decimal	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Hexadecimal	0	1	2	3	4	5	6	7	8	9	A	b	C	d	E	F

Example:



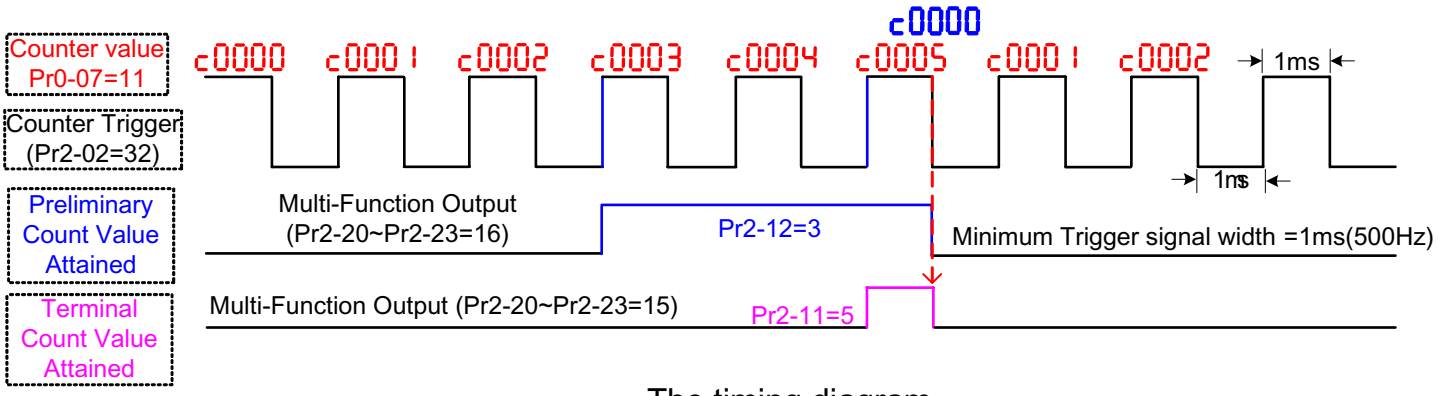
The two of 2 bit binary number should be converted to Decimal number(D) and then converted to 2 digit Hexadecimal number(H): below is shown how to calculate:
1'st digit: $1x2^3+1x2^2+1x2^1+1x2^0=8+4+2+1=15(D)=F(H)$
2nd digit: $1x2^3+0x2^2+1x2^1+0x2^0=8+0+2+0=10(D)=A(H)$
Fill the two of 2 digit Hexadecimal number(H) ¥ A¡ ¥ F¡ into Pr2-10 to determines the digital Input terminals status

Pr2-11	Terminal Count Value	Factory default	0
	Settings	0~65500	

The counter trigger can be set by the multi-function terminal MI2 (set Pr2-02 to 32). Upon completion of counting, the specified output terminal will be activated (Pr2-20~Pr2-23 is set to 15).

Pr2-12	Preliminary Count Value	Factory default	0
	Settings	0~65500	

When the counter value reaches this value, the corresponding multi-function output terminal will be activated, provided one of Pr2-20~Pr2-23 is set to 16. This parameter can be used for the end of the count to make the drive run from the low speed to a stop.



The timing diagram

Pr2-13	Digital Pulse Output Gain	Factory default	1
	Settings	1~20	

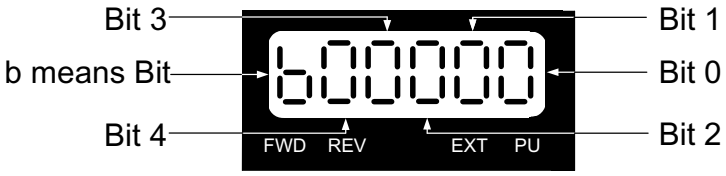
This parameter determines the signals of the Multi-Function Output 4 (when Pr2-23=25) (MO2-DCM) and of the digital pulse frequency output.

The number of output pulses per second = actual output frequency × (Pr2-13).
The maximum output pulse frequency is 2KHz (pulse duty cycle = 50%).

Pr2-14	Pre-set Arrival Frequency 1	Factory default	60.00/50.00
	Settings	0.00~600.00 Hz	
Pr2-15	Pre-set Arrival Frequency 1 band width	Factory default	2.00
	Settings	0.00~600.00 Hz	
Pr2-16	Pre-set Arrival Frequency 2	Factory default	60.00/50.00
	Settings	0.00~600.00 Hz	
Pr2-17	Pre-set Arrival Frequency 2 band width	Factory default	2.00
	Settings	0.00~600.00 Hz	

Once the output frequency/(speed) reaches the arbitrary designated frequency/(speed), and if the corresponding multi-function output terminal is set as 4~7 (Pr2-20~Pr2-23), then the multi-function output terminal contact will be ON.

Pr2-18	Multi-Function Output Direction	Factory default	b00000
	Settings	Bit 0~Bit 3 separate setting as table in below	



	Bit 3	Bit 2	Bit 1	Bit 0
Settings	MO2 (Pr2-23)	MO1 (Pr2-22)	Relay 2 (Pr2-21)	Relay 1 (Pr2-20)
0	Normally On	Normally On	Normally On	Normally On
1	Normally Closed	Normally Closed	Normally Closed	Normally Closed

This function uses the Bit setting method, if the bit is 1, the multi-function output terminal will be reversed.

Example 1: If Pr2-20 is 1 (drive running), and Bit 0 is set to 0, then Relay 1 will be ON when the drive is running and OFF when the drive is stopped.

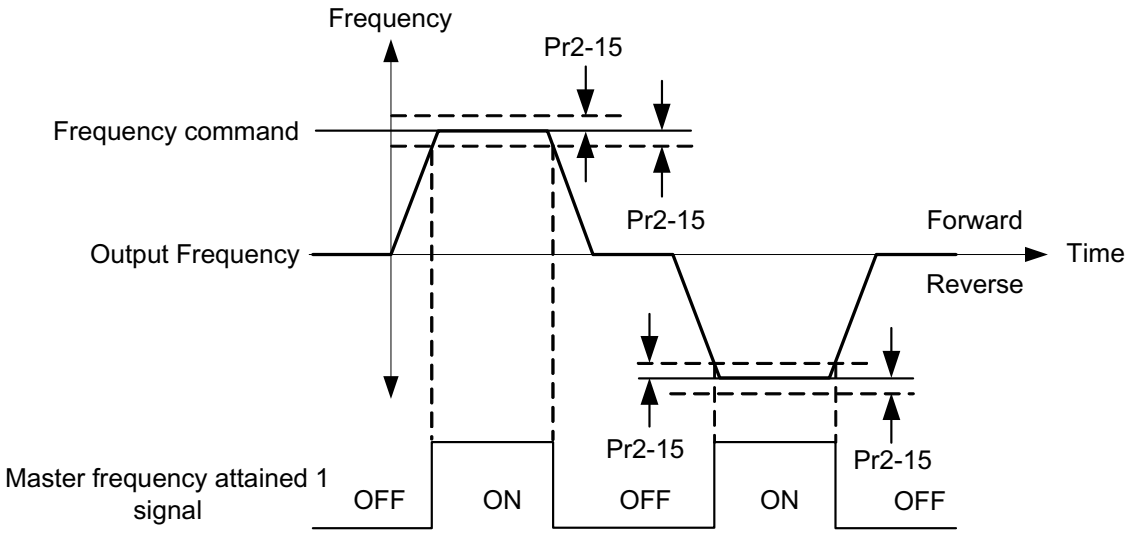
Example 2: If Pr2-20 is 1 (drive running), and Bit 0 is set to 1, then Relay 1 will be OFF when the drive is running and ON when the drive is stopped.

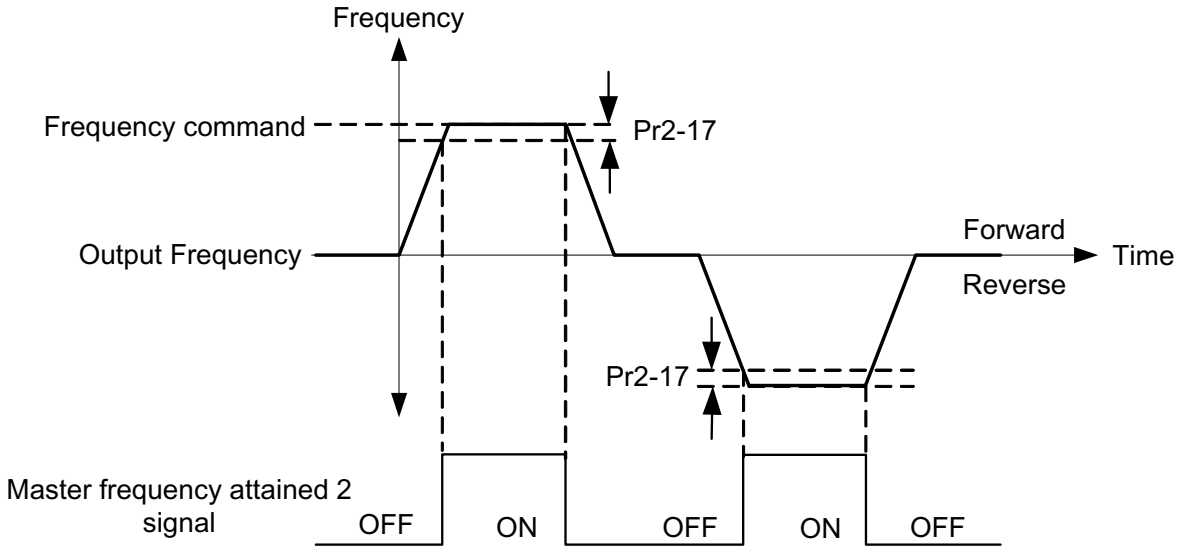
Pr2-19	Delay time of Multi-Function Output terminals	Factory default	0.003
♦	Settings	0.000~60.000 Sec	

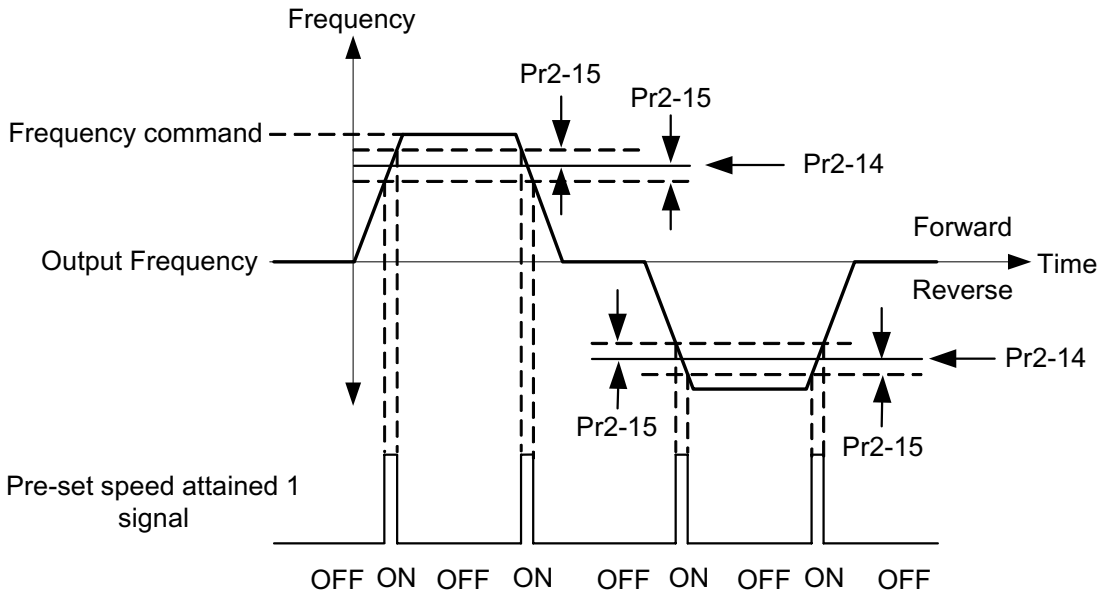
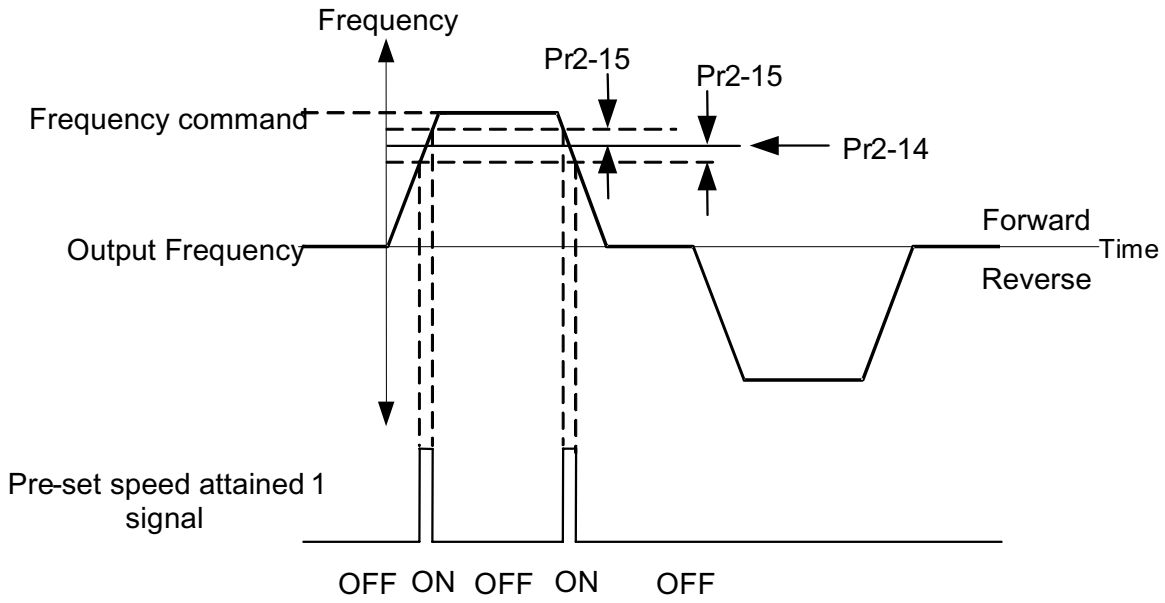
This parameter determines the delay time between signals established and the Multi-Function Output terminals reacting.

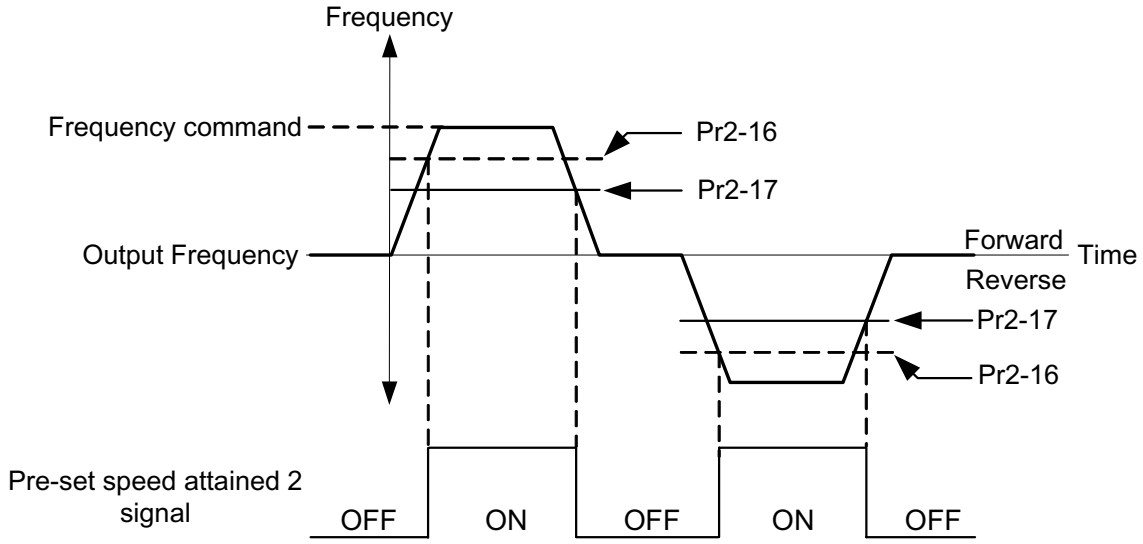
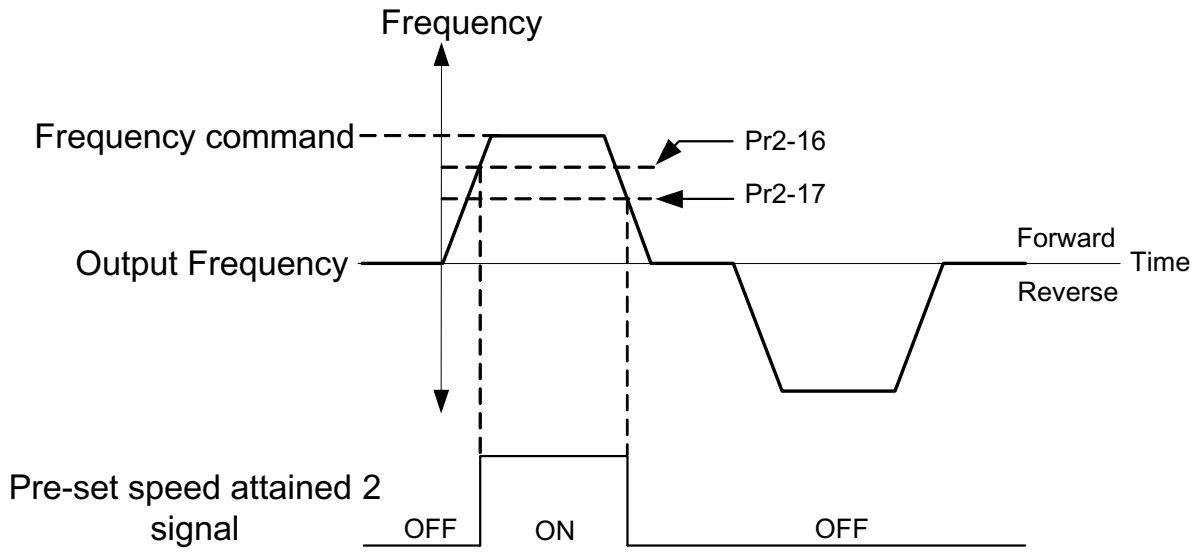
Pr2-20	[Pr2-19]	Multi-Function Output 1 (Relay 1)	Factory default	11
Pr2-21	[Pr2-20]	Multi-Function Output 2 (Relay 2)	Factory default	1
Pr2-22	[Pr2-21]	Multi-Function Output 3 (MO1)	Factory default	5
Pr2-23	[Pr2-22]	Multi-Function Output 4 (MO2)	Factory default	9

Settings	Functions	Explanations
1	Drive running	The corresponding output will be closed during operation (including DC braking time).
2	Master frequency attained 1 (Both Forward and Reverse)	The corresponding output will be closed when output frequency is equal to master command frequency or within the bandwidth (Pr2-15). Effective both Forward and Reverse
3	Master frequency attained 2 (Both Forward and Reverse)	The corresponding output will be closed when drive accelerates to master command frequency or within the bandwidth (Pr2-17). But will neglect the bandwidth (Pr2-17) while in decel. Effective both Forward and Reverse





4	Pre-set speed attained 1 (Both Forward and Reverse)	The corresponding output will be closed when output frequency is equal to pre-set speed attained 1 (Pr2-14) or within the bandwidth (Pr2-15). Effective both Forward and Reverse
		
5	Pre-set speed attained 1 (Forward only)	The corresponding output will be closed when output frequency is equal to pre-set speed attained 1 (Pr2-14) or within the bandwidth (Pr2-15). Effective only in Forward .
		

6	Pre-set speed attained 2 (Both Forward and Reverse)	The corresponding output will be closed when drive accelerates to pre-set speed attained 2(Pr2-16). But will count in the bandwidth (Pr2-17) while in decel. Effective both Forward and Reverse
		
7	Pre-set speed attained 2 (Forward only)	The corresponding output will be closed when drive accelerates to pre-set speed attained 2(Pr2-16). But will count in the bandwidth (Pr2-17) while in decel. Effective only in Forward.
		
8	Drive in decel	The corresponding output will be closed when the drive is in decel.
9	Drive ready for use	The corresponding output will be closed when the drive is ready and has no faults.
10	Low voltage alarm (LU, LUr)	The corresponding output will be closed when the DC Bus voltage drops below set value in Pr5-06. The keypad will display “LU” or “LUr”.

11	Fault Indication	The corresponding output will be closed when drive has experienced a fault.
12	Base block (B.B.) Indication	The corresponding output will be closed when the drive is shut off by external base block.
13	Zero Speed (including shutdown)	The corresponding output will be closed when the drive has no output voltage.
14	Zero speed (while in run)	The corresponding output will be closed when the drive has no output voltage.(While the run command is active)
15	Terminal Count Value Attained	The corresponding output will be closed when Terminal Count Value Attained (Pr2-11)
16	Preliminary Count Value Attained	The corresponding output will be closed when Preliminary Count Value Attained (Pr2-12)
17	PLC Run running	The corresponding output will be closed when PLC Run is running
18	PLC Run paused	The corresponding output will be closed when PLC Run operation is paused.
19	A step of PLC Run completed	The corresponding output will be closed for 0.5 sec when each multi-step speed is completed
20	PLC Run completed	The corresponding output will be closed for 0.5 sec when the PLC Run cycle has completed
21	IGBT over-heat indication (oH1)	The corresponding output will be closed when the IGBT temperature exceeds the over-heat value set in Pr5-20
22	Dwell Accel/Decel interruption	The corresponding output will be closed when the Dwell Accel/Decel is interrupted. Refer to Pr6-14, Pr6-16
23	Operation Mode indication	The corresponding output will be closed when the drive “Operation Command” is controlled by the external terminals.
24	Over-torque 1 (ot1)	The corresponding output will be closed when over-torque 1 is detected. Refer to Pr5-16 and Pr5-17.
25	Digital frequency signal output (only MO2)	Valid for Multi-Function Output 4 (Pr2-23), output gain can be adjusted from (Pr2-13)
26	Software braking output (MO1, Pr2-22 only)	The corresponding output will be closed when the drive DC bus voltage exceeds the braking level set value in Pr5-08..
27	Auxiliary Motor no. 1	For the fan & pump control applications, runs with multiple motors in circulation control mode. refer to Pr8-01 ~ Pr8-04
28	Auxiliary Motor no. 2	
29	Auxiliary Motor no. 3	
♦30	Over-torque 2 (ot2)	The corresponding output will be closed when over-torque 1 detected. Refer to Pr5-22 and Pr5-23.
♦31	Heatsink over-heat indication (oH2)	The corresponding output will be closed when the heatsink temperature exceeds the over-heat value set in Pr5-47
♦32	Motor selection output (Pr5-49)	The corresponding output will be closed when motor selection is enabled (MIx=42) and the time is longer than Pr5-48 set value.
48~63	PLC Run step indication	Corresponds to the 0~15 step speeds

Group 3: Analog Input/Output Parameters

Pr3-00	Addition Function of the Analog Inputs			Factory default	0
	Settings	0	enable addition function		
		1	disable addition function (AVI,ACI, AUI)		

If the addition function between AVI, ACI and AUI are disabled, and the selection on the analog input setting function are the same among the three, the priority order of the analog input will be: AVI > ACI > AUI.

The addition between a positive value and a negative value, then the meaning is to subtract.

Pr3-01	Analog Input Noise Filter		Factory default	0.10
	Settings	0.00~2.00 sec		

Interferences commonly exist with analog signals, such as those entering AVI, ACI and AUI. These interferences constantly affect the stability of analog control and using the Input Noise Filter will create a more stable system.

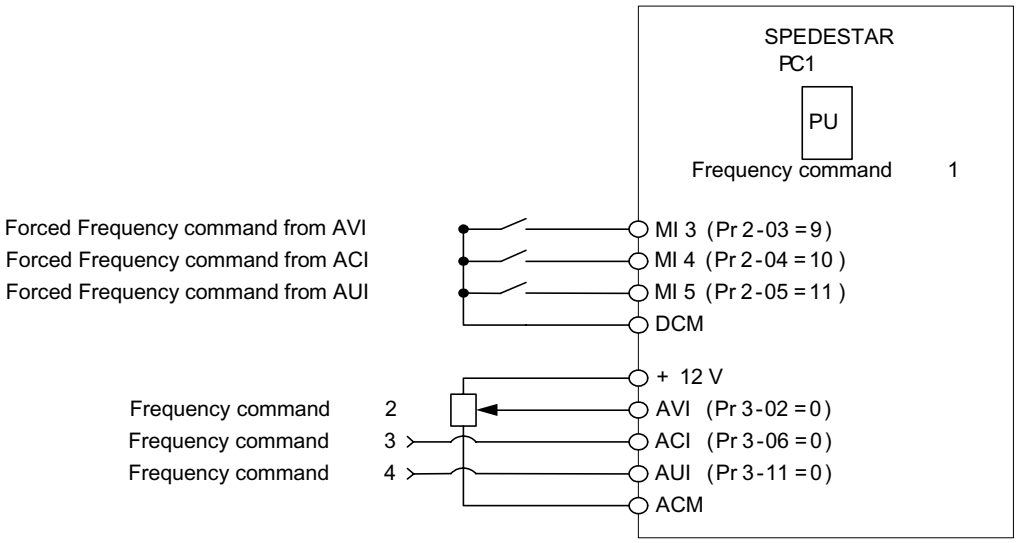
If Pr3-01 is long, the control will be stable, yet the response to the input will be slow.
If Pr3-01 is short, the control may be unstable, yet the response to the input will fast.

Pr3-02	AVI Analog Input (External Analog command)			Factory default	1
Pr3-06	ACI Analog Input (External Analog command)			Factory default	0
Pr3-11	AUI Analog Input (External Analog command)			Factory default	0
Valid for **ACI** (Pr3-06) and **AUI** (Pr3-11)	Settings	0	No functions		
		1	Frequency command		
		2	Acceleration/deceleration time gain (increase or decrease time base)		
		3	Over-current stall prevention level during operation		
		4	Over-current stall prevention level during Acceleration		
		5	Over-torque current level		
		6	Torque compensation gain		
		7	AVI auxiliary frequency (multiplication by the ratio of AVI)		
		8	ACI auxiliary frequency (multiplication by the ratio of ACI)		
		9	AUI auxiliary frequency (multiplication by the ratio of AUI)		
		10	Auxiliary frequency of master frequency		
		11	PID feedback signal		
		12	PID offset signal		
		13	DC Braking Current Level (same as Pr6-00)		
		14	Torque adjust during run. (AVI Pr3-02 only)		
		15	External temperatures signal		

When 14 is set, an external analog voltage (0.00~10.00V) signal can be used as a torque adjust command during run. The function is identical to the Middle Voltage 1 (Pr1-04) adjust.

This makes “Spedestar + an induction motor” work as a torque motor control system. Which is a very popular in winding applications.

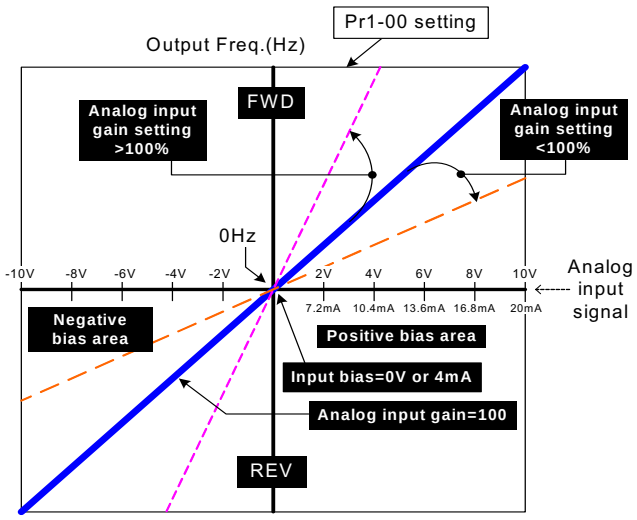
User may switch frequency command between PU (Pr0-18=0), AVI, ACI and AUI via MI3, MI4, and MI5.



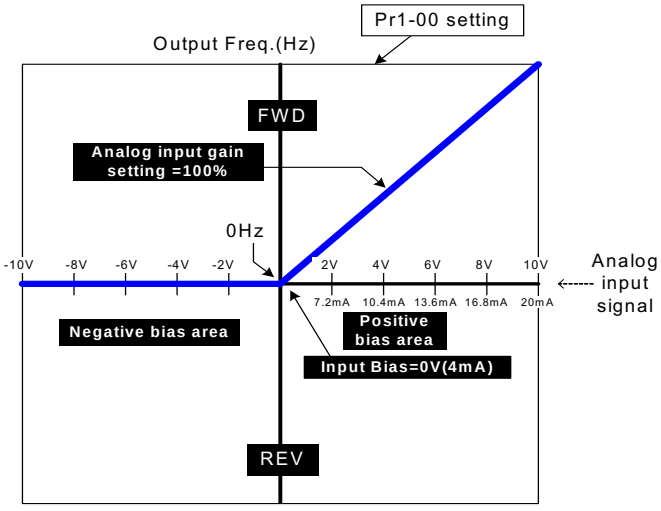
Pr3-03	AVI Analog Input Bias	Factory default	0.00
	Settings	-10.00~10.00V	

This parameter determines the AVI voltage value that corresponds to 0 point of External Analog command.

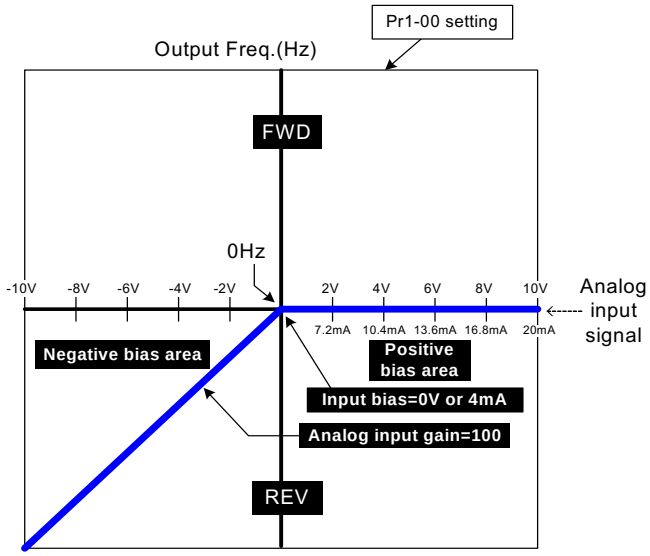
Pr3-04	AVI Analog Input Gain		Factory default	100.0
	Settings	-500.0~+500.0%		
Pr3-05	**AVI Positive/Negative Bias Mode**		Factory default	0
	Settings	0	zero bias	
		1	value lower than bias = bias	
		2	value higher than bias = bias	
		3	the absolute value of the bias voltage while serving as the center	



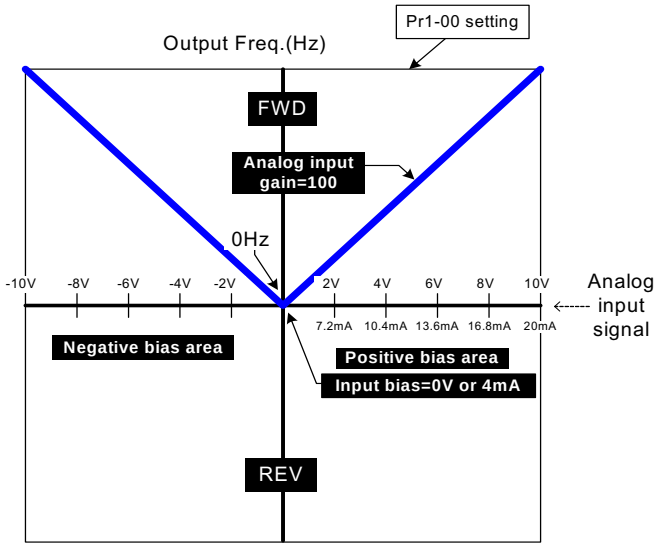
Positive/negative bias mode:
Bias as the center
(Pr3-05=0 or Pr3-09=0 or Pr3-14=0)



Positive/negative bias mode:
lower than § bias = biasï
(Pr3-05=1 or Pr3-09=1 or Pr3-14=1)



Positive/negative bias mode:
higher than § bias = bias¡
(Pr3-05=2 or Pr3-09=2 or Pr3-14=2)



Positive/negative bias mode:
Absolute value of the bias
(Pr3-05=3 or Pr3-09=3 or Pr3-14=3)

Pr3-06	**ACI Analog Input (Same as Pr3-02)**		Factory default	0.00
Pr3-07	**ACI Analog Input Bias**		Factory default	4.00
	Settings	0.00~20.00mA		

This parameter determines the ACI current value that corresponds to 0 point of External Analog command.

Pr3-08	**ACI Analog Input Gain**		Factory default	100.0
	Settings	-500.0~+500.0%		
Pr3-09	**ACI Positive/Negative Bias Mode**		Factory default	1
	Settings	0	zero bias	
		1	value lower than bias = bias	
		2	value higher than bias = bias	
		3	the absolute value of the bias voltage while serving as the center	

Pr3-10	**Loss of the ACI signal**		Factory default	0
	Settings	0	disabled	
		1	Continue operation by the last frequency command	
		2	Decelerate to stop	
		3	Coast to stop and display ACI.	

This parameter determines the behavior when the 4~20mA (ACI) signal is lost.
When set to 1 or 2, it will display a warning message “ACI.” on the keypad in case of loss of ACI signal, and execute the setting. When ACI signal is recovered, the warning message usually disappears automatically. If the warning message is still displayed, please press “DISP” key to make it disappear.

Pr3-11	AUI Analog Input (Same as Pr3-02)		Factory default	0.00
Pr3-12	AUI Analog Input Bias		Factory default	0.00
	Settings	-10.00~10.00V		

This parameter determines the AUI voltage value that corresponds to 0 point of External Analog command.

Pr3-13	AUI Analog Input Gain		Factory default	100.0
	Settings	-500.0~+500.0%		
Pr3-14	AUI Positive/Negative Bias Mode		Factory default	0
	Settings	0	zero bias	
		1	value lower than bias = bias	
		2	value higher than bias = bias	
		3	the absolute value of the bias voltage while serving as the center	

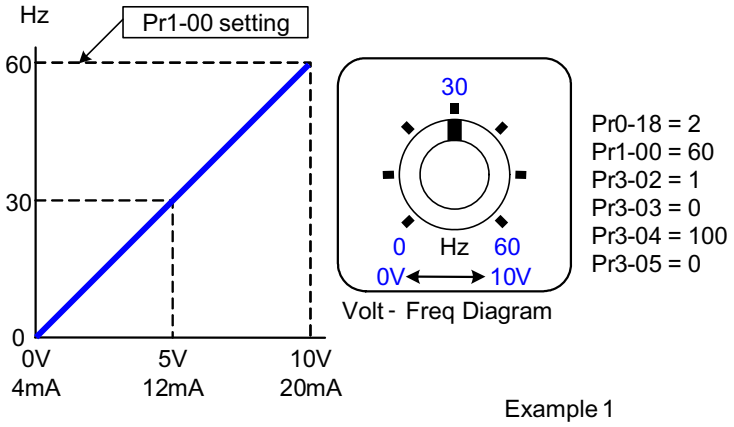
How to calculate Analog Input Gain?

Analog Input Gain for AVI and AUI (Pr3-04, Pr3-13):

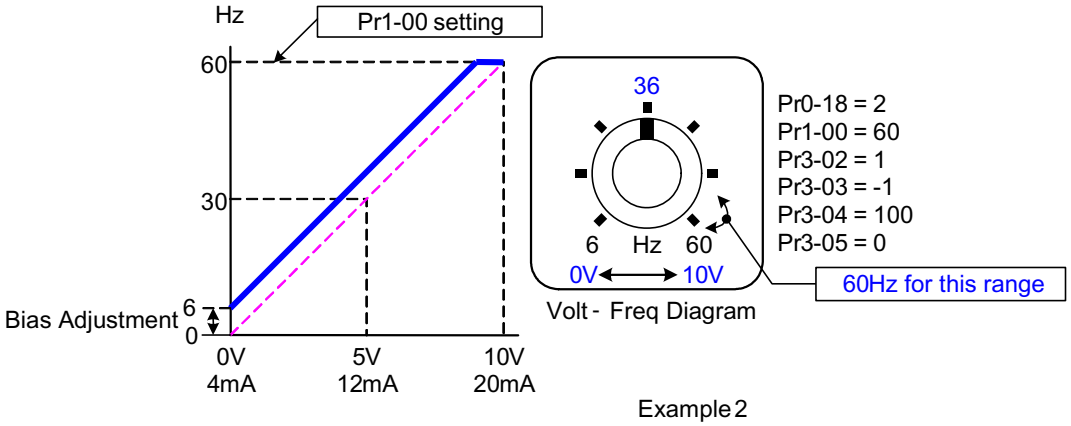
$$\text{Input Gain} = \frac{\text{Expected output Freq. at the max. external analog voltage (Hz)}}{\text{[Max. external analog volt - Input bias (Pr3-03 or Pr3-12)] (V)}} \times \frac{10\text{V}}{\text{Pr1-00 (Hz)}} \times 100\%$$

Analog Input Gain for ACI (Pr3-08):

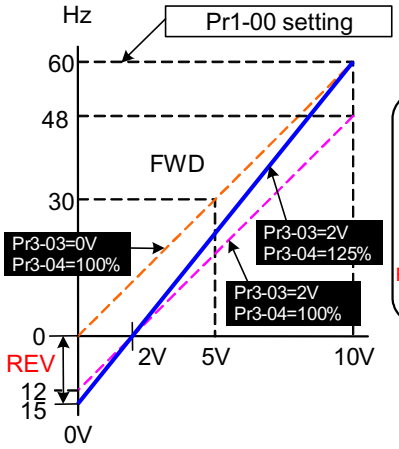
$$\text{Input Gain} = \frac{\text{Expected output Freq. at the max. external analog current (Hz)}}{\text{[Max. external analog current - Input bias (Pr3-08)] (mA)}} \times \frac{(20\text{-}4)\text{ mA}}{\text{Pr1-00 (Hz)}} \times 100\%$$

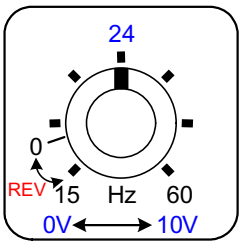


Example 1



Example 2





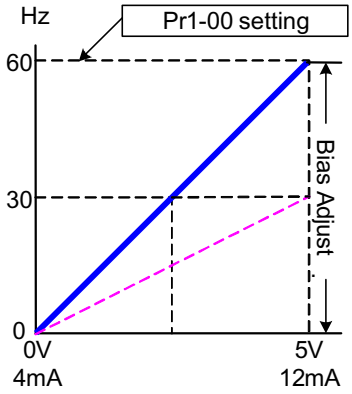
Volt - Freq Diagram

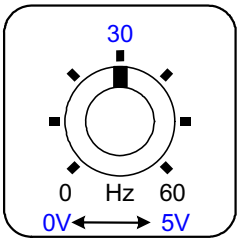
Pr0-18 = 2
Pr1-00 = 60
Pr3-02 = 1
Pr3-03 = 2
Pr3-04 = 125
Pr3-05 = 0

Input Gain Calculation

$$Pr3-04=\frac{60Hz}{(10-2)V}\times\frac{10V}{60Hz}\times100\%=125\%$$

Example 3





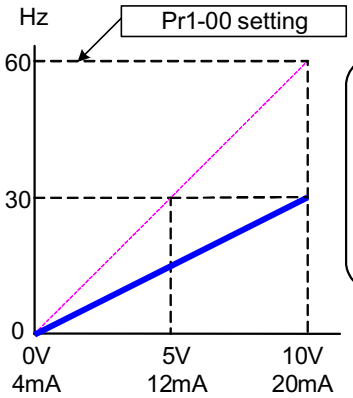
Volt - Freq Diagram

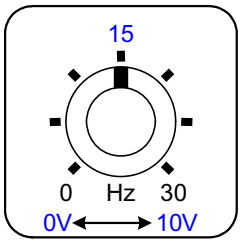
Pr0-18 = 2
Pr1-00 = 60
Pr3-02 = 1
Pr3-03 = 0
Pr3-04 = 200
Pr3-05 = 0

AVI Input Gain Calculation

$$Pr3-04=\frac{60Hz}{(5-0)V}\times\frac{10V}{60Hz}\times100\%=200\%$$

Example 4





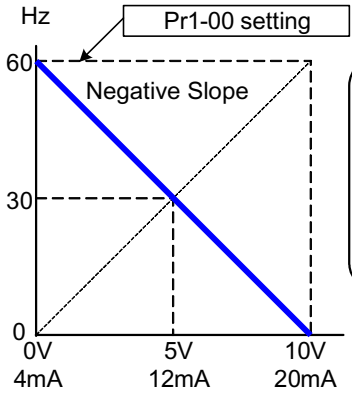
Volt - Freq Diagram

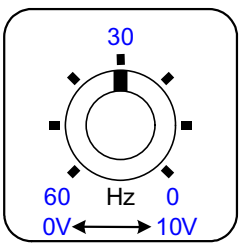
Pr0-18 = 2
Pr1-00 = 60
Pr3-02 = 1
Pr3-03 = 0
Pr3-04 = 50
Pr3-05 = 0

Input Gain Calculation

$$Pr3-04=\frac{30Hz}{(10-0)V}\times\frac{10V}{60Hz}\times100\%=50\%$$

Example 5

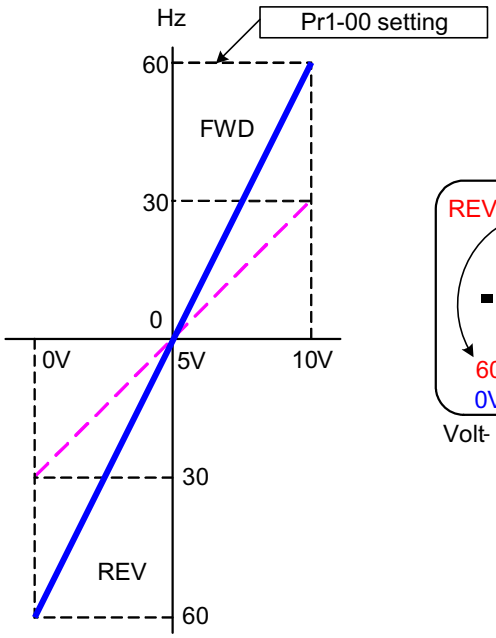


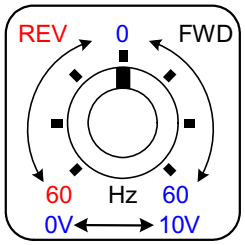


Volt - Freq Diagram

Pr0-18 = 2
Pr1-00 = 60
Pr3-02 = 1
Pr3-03 = 10
Pr3-04 = -100
Pr3-05 = 0

Example 6





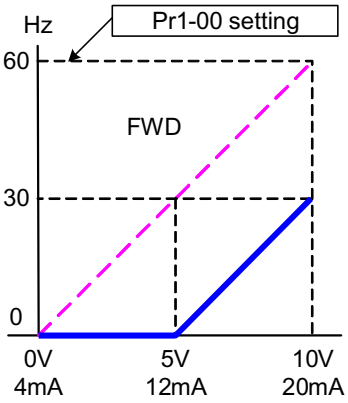
Volt- Freq Diagram

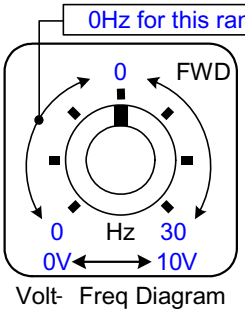
Pr0-18 = 2
Pr1-00 = 60
Pr3-02 = 1
Pr3-03 = 5
Pr3-04 = 200
Pr3-05 = 0

Input Gain Calculation

$$Pr3-04=\frac{60Hz}{(10-5)V}\times\frac{10V}{60Hz}\times100\%=200\%$$

Example 7

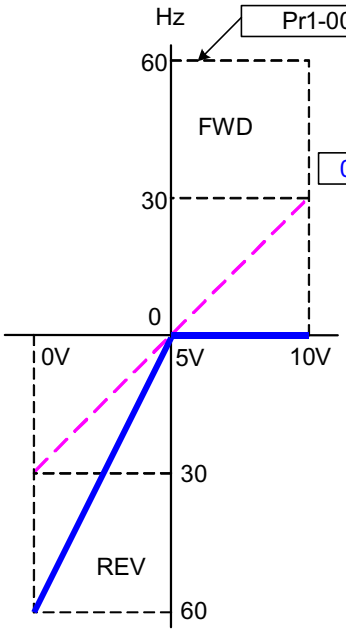


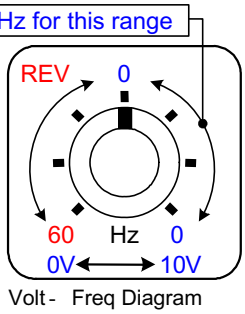


Volt- Freq Diagram

Pr0-18 = 2
Pr1-00 = 60
Pr3-02 = 1
Pr3-03 = 5
Pr3-04 = 100
Pr3-05 = 1

Example 8





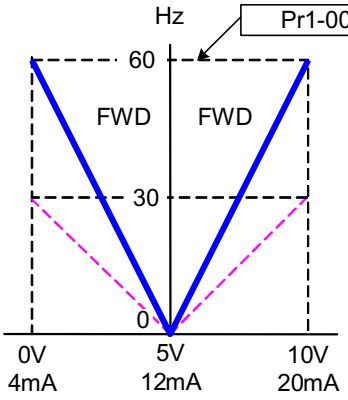
Volt- Freq Diagram

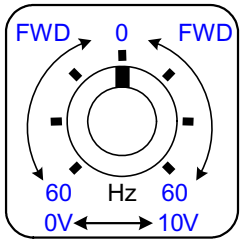
Pr0-18 = 2
Pr1-00 = 60
Pr3-02 = 1
Pr3-03 = 5
Pr3-04 = 200
Pr3-05 = 2

Input Gain Calculation

$$Pr3-04=\frac{60Hz}{(10-5)V}\times\frac{10V}{60Hz}\times100\%=200\%$$

Example 9





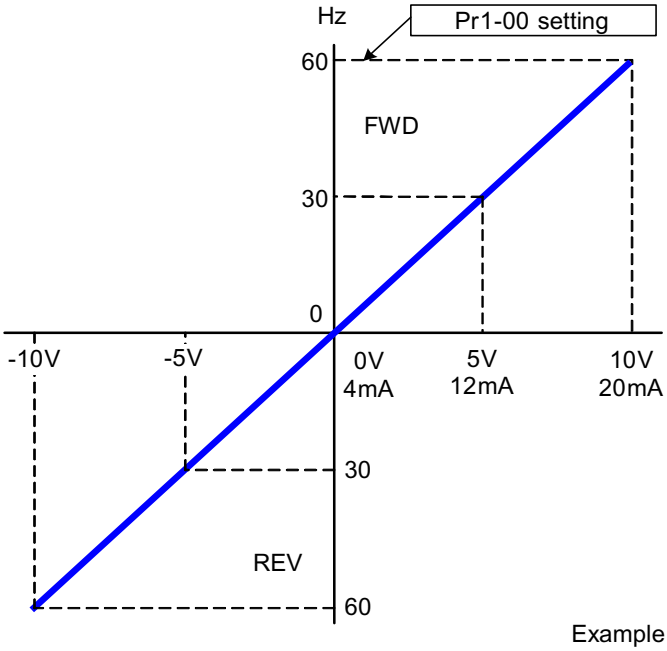
Volt- Freq Diagram

Pr0-18 = 2
Pr1-00 = 60
Pr3-02 = 1
Pr3-03 = 5
Pr3-04 = 200
Pr3-05 = 3

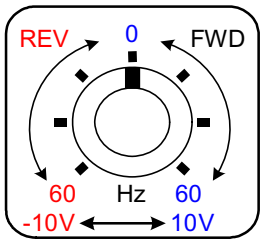
Input Gain Calculation

$$Pr3-04 = \frac{60Hz}{(10-5)V} \times \frac{10V}{60Hz} \times 100\% = 200\%$$

Example 10



Pr0-18 = 2
Pr1-00 = 60
Pr3-11 = 1
Pr3-12 = 0
Pr3-13 = 100
Pr3-14 = 2



Volt - Freq Diagram

Example 11

Pr3-15	**AVO Analog Output 1 Selection**	Factory default	0
	Settings 0-15		
Pr3-16	**ACO Analog Output 2 Selection**	Factory default	0
	Settings 0-15		

Setting	Function	Description
0	Output frequency (Hz)	Max. Operation frequency Pr1-00 is regarded as 100%.
1	Command frequency (Hz)	Max. Operation frequency Pr1-00 is regarded as 100%.
2	Motor Speed	Max. Operation frequency Pr1-00 is regarded as 100%.
3	Output current (A rms)	Rated current of the drive =100%
4	Output voltage (VAC)	200V=100%
5	DC BUS voltage (VDC)	400V=100%
6	Power factor	-1.000~1.000=100%

7	Power	Rated power of the drive =100%
8	AVI (V)	0~10V=0~100%
9	ACI (mA)	0~20mA=0~100%
10	AUI (V)	-10~10V=0~100%
13	Voltage command	200V=100%
14	Counter Value	Pr2-11=100%
15	Analog Output Value	(Pr3-21)

Pr3-17	**AVO Analog Output Gain**		Factory default	100.0
	Settings	-900.0~900.0%		
Pr3-18	**ACO Analog Output Gain**		Factory default	80.0
	Settings	-900.0~900.0%		

Pr3-17 adjusts the voltage level of the analog output 1 signal (AVO).

Pr3-18 adjusts the current level of the analog output 2 signal (ACO).

Pr3-19	**AVO Analog Output Bias Voltage**		Factory default	0.00
	Settings	-10.00~10.00V		
Pr3-20	**ACO Analog Output Bias Current**		Factory default	4.00
	Settings	0.00~20.00mA		

These parameters determine the output voltage/current value corresponding to 0% output of Pr3-15 and Pr3-16

Pr3-21	**Analog Output Value**		Factory default	0.0
	Settings	0.0~100.0%		

When Pr3-15=15 or Pr3-16=15, this is the output value.

Group 4: Multi-Step Speed and Process Logic Control Operation Parameters

With 4 multi-function input terminals (refer to Pr2-01 to Pr2-06) user can operate the drive, up to 15 pre-set Multi-Step Speeds Run (MSS Run). These speeds may also be used in conjunction with Pr4-15 ~ Pr4-35 to run the process Logic control operation (PLC Run).Their relative parameters are below:

	step	Frequency command	Operation Command	Operation Direction	Accel/Decel time
Multi-Step Speed Run	15	Pr4-00~Pr4-14	MI1~MI6	Pr4-32, Pr4-36	Pr1-11~Pr1-16
PLC Run	15	Pr4-00~Pr4-14	Pr4-15~Pr4-30	Pr4-32 ,Pr4-33	Pr1-11~Pr1-16

Pr4-00	**The 1st Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
Pr4-01	**The 2nd Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
Pr4-02	**The 3rd Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
Pr4-03	**The 4th Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
Pr4-04	**The 5th Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
Pr4-05	**The 6th Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
Pr4-06	**The 7th Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
Pr4-07	**The 8th Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
Pr4-08	**The 9th Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
Pr4-09	**The 10th Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
Pr4-10	**The 11th Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
Pr4-11	**The 12th Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
Pr4-12	**The 13th Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
Pr4-13	**The 14th Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
Pr4-14	**The 15th Step Speed Frequency of PLC Run or MSS Run**	Factory default	0.00
	Settings	0.00~600.00 Hz	

The multi-function input terminals (refer to Pr2-01 to Pr2-06) are used to select one of the drive's Multi-Step Speeds above. These speeds may also be used in conjunction with Pr4-15 ~ Pr4-30 to run the process control operation (PLC Run).

Pr4-15	**Time Duration of the PLC Run Master Speed**	Factory default	0.00
Pr4-16	**The 1st Step Duration of PLC Run or MSS Run**	Factory default	0.00
Pr4-17	**The 2ndStep Duration of PLC Run or MSS Run**	Factory default	0.00
Pr4-18	**The 3rd Step Duration of PLC Run or MSS Run**	Factory default	0.00
Pr4-19	**The 4th Step Duration of PLC Run or MSS Run**	Factory default	0.00
Pr4-20	**The 5th Step Duration of PLC Run or MSS Run**	Factory default	0.00
Pr4-21	**The 6th Step Duration of PLC Run or MSS Run**	Factory default	0.00
Pr4-22	**The 7th Step Duration of PLC Run or MSS Run**	Factory default	0.00
Pr4-23	**The 8th Step Duration of PLC Run or MSS Run**	Factory default	0.00
Pr4-24	**The 9th Step Duration of PLC Run or MSS Run**	Factory default	0.00
Pr4-25	**The 10th Step Duration of PLC Run or MSS Run**	Factory default	0.00
Pr4-26	**The 11th Step Duration of PLC Run or MSS Run**	Factory default	0.00
Pr4-27	**The 12th Step Duration of PLC Run or MSS Run**	Factory default	0.00
Pr4-28	**The 13th Step Duration of PLC Run or MSS Run**	Factory default	0.00
Pr4-29	**The 14th Step Duration of PLC Run or MSS Run**	Factory default	0.00
Pr4-30	**The 15th Step Duration of PLC Run or MSS Run**	Factory default	0.00
	Settings	0~65500 sec	

Pr4-15 to Pr4-30 correspond to operation time of the master speed and each step speed defined by Pr4-00 to Pr4-14. The maximum setting of 6550.0 seconds will be displayed as “d6550.0”. If display shows “d6550.0”, it means 6550.0 seconds.

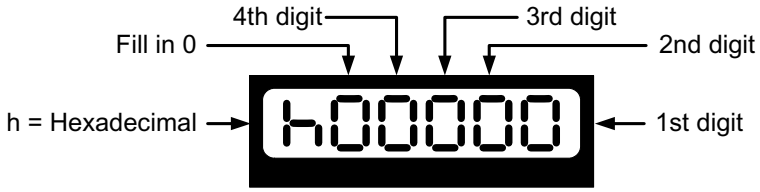
If a parameter is set to “0.0” (0 sec), the corresponding step will be skipped. This is commonly used to reduce the number of program steps.

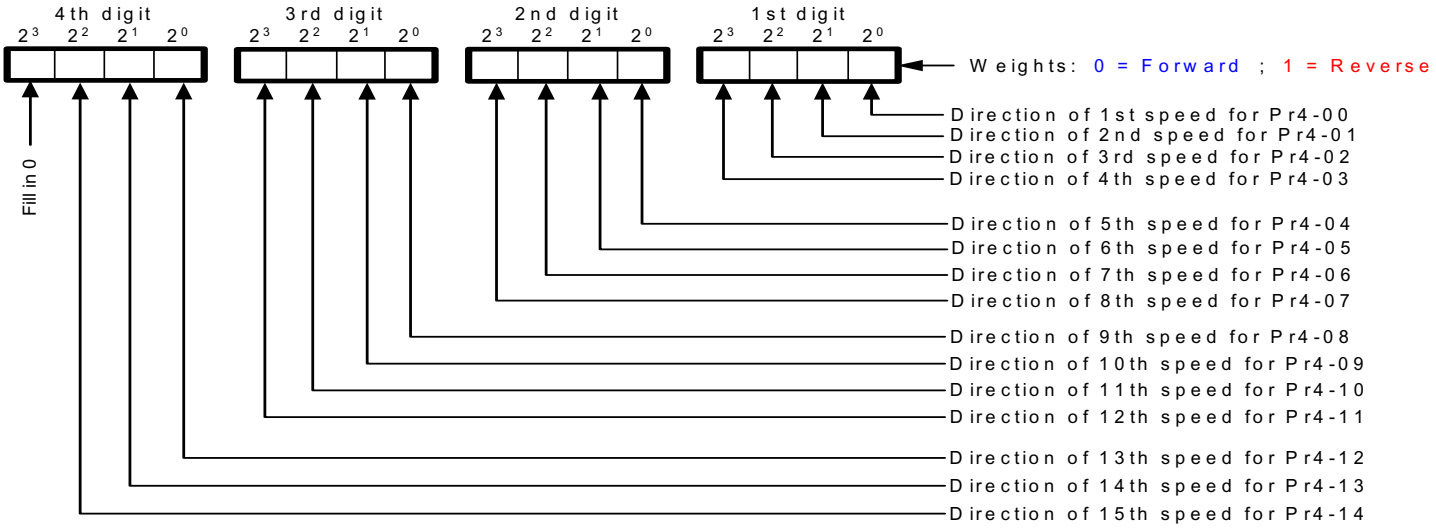
Pr4-31	The PLC Run or MSS Run Time Multiplier	Factory default	1
	Settings	1~10	

This parameter sets the time unit for Pr4-15~Pr4-30.
The actual operation time of each step= The setting time of Pr4-15~Pr4-30 * Pr4-31

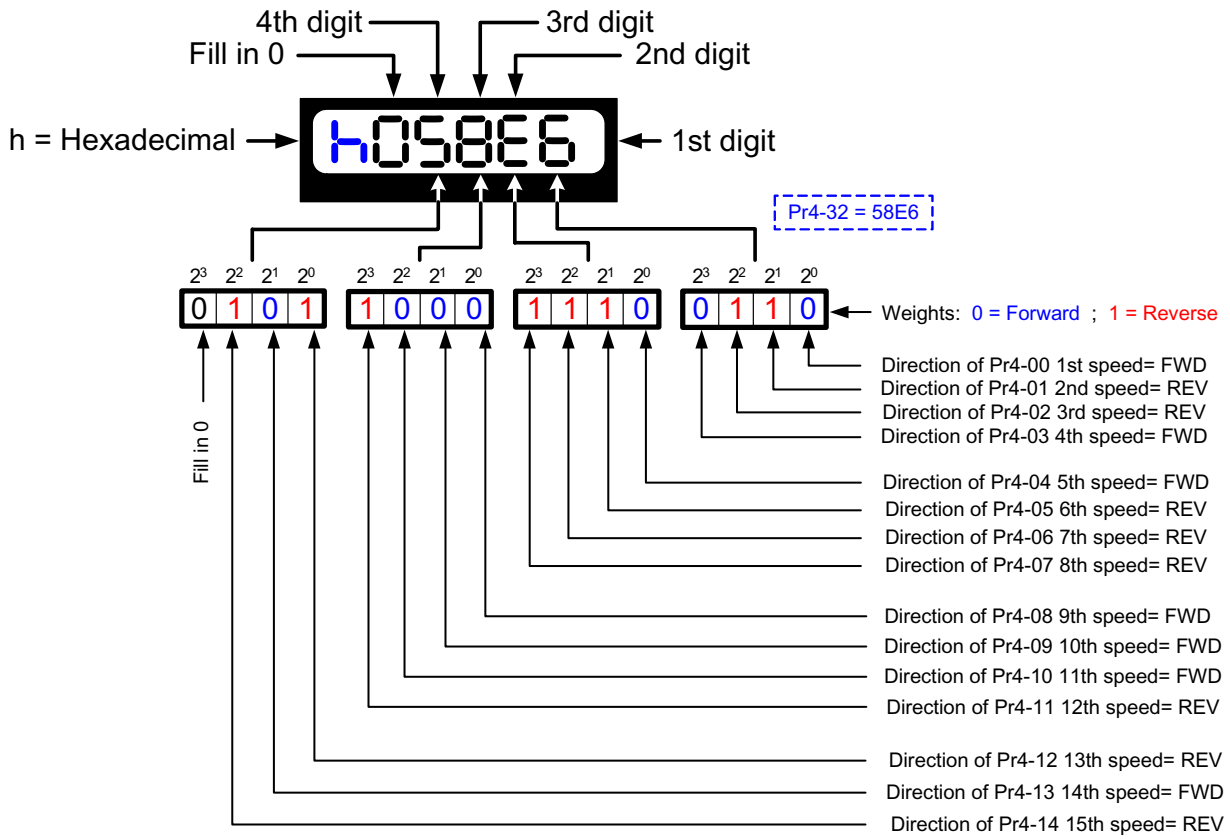
Pr4-32	The PLC Run or MSS Run Operation Direction	Factory default	h00000
	Settings	00000~07FFF(0:forward;1:reverse)	

This parameter controls the direction of Pr4-00~Pr4-14, for the PLC Run and MSS Run. Use four of 4 bit binary number determines the PLC Run direction. The binary number is then converted to 4 digit Hexadecimal number and entered into Pr4-32.





Example:



The four of 4 bit binary number should be converted to 4 digit Decimal number(D) and then converted to 4 digit Hexadecimal number(H):
below is shown how to calculate:

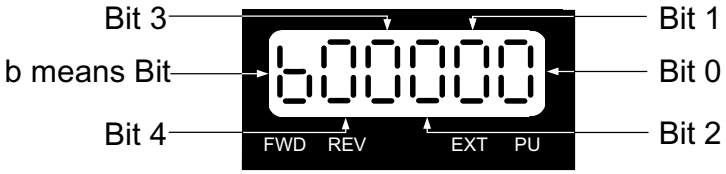
1st digit: $0x2^3+1x2^2+1x2^1+0x2^0 = 0+4+2+0=6(D) = 6(H)$
2nd digit: $1x2^3+1x2^2+1x2^1+0x2^0 = 8+4+2+0=14(D) = E(H)$
3rd digit: $1x2^3+0x2^2+0x2^1+0x2^0 = 8+0+0+0=8(D) = 8(H)$
4th digit: $0x2^3+1x2^2+0x2^1+1x2^0 = 0+4+0+1=5(D) = 5(H)$

Fill the four of 4 digit Hexadecimal number(H) ¥ 5¡ ¥ 8¡ ¥ E¡ ¥ 6¡ into Pr4-32 to determines the direction of 15 steps speed.

Conversion table between Decimal and Hexadecimal

Decimal	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Hexadecimal	0	1	2	3	4	5	6	7	8	9	A	b	C	d	E	F

Pr4-33	**PLC Run Operation Mode**		Factory default	b00000
	Settings	Bit 0	0	direction determined by Pr4-32
			1	direction determined by the master speed
		Bit 1	0	Without zero intervals (Continue mode)
			1	With zero intervals (Stop mode)
		Bit 2	0	Run zero speed when PLC Run Paused
			1	Run original programmed step speed when PLC Run Paused
		Bit 3	0	Re-Execute PLC Run from step 0 after recovery from power interruption
			1	Continue Execute PLC Run from the point which power interrupted after recovery from power interruption

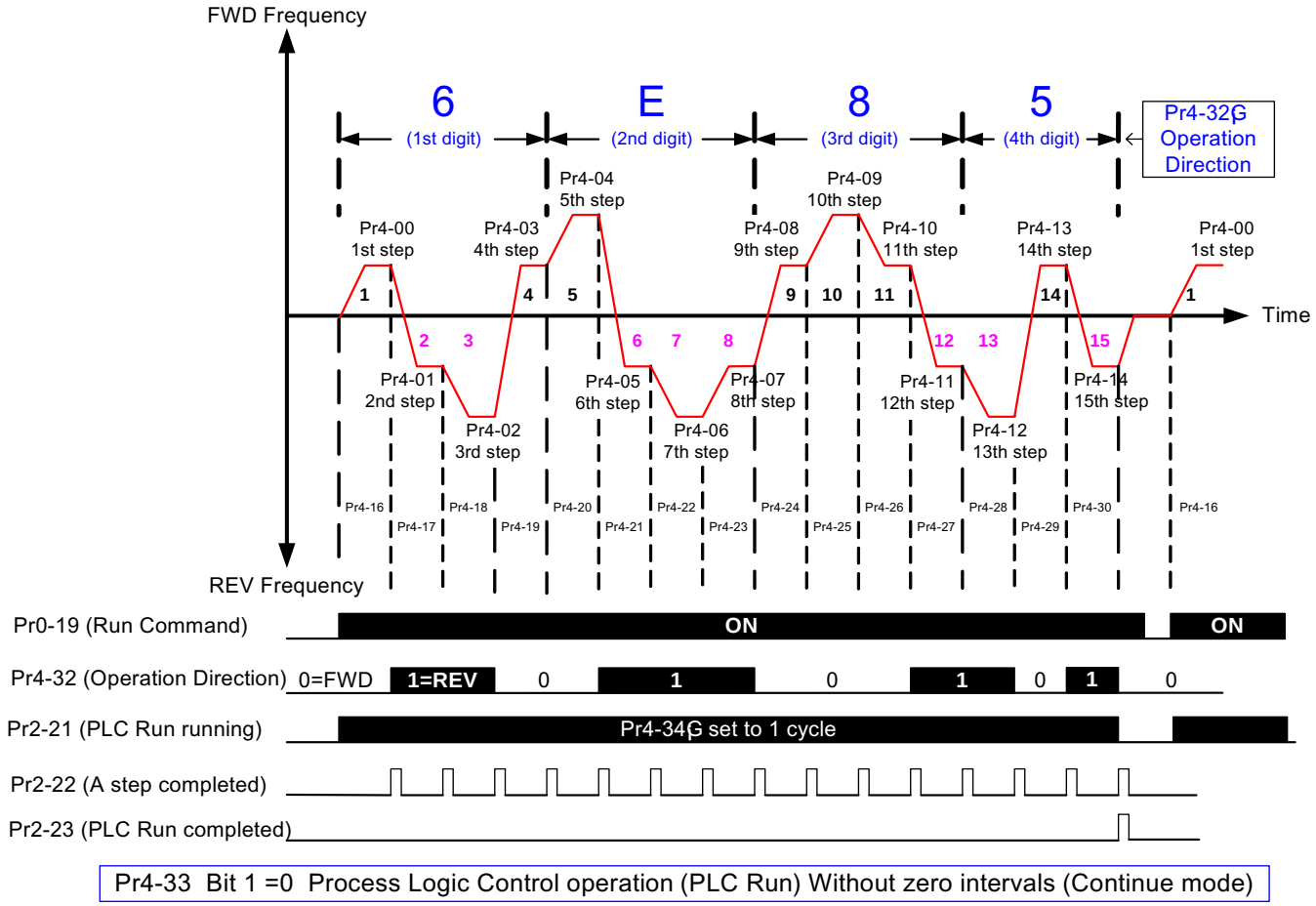


This parameter selects the mode of PLC Run operation for the drive. The drive will change speeds and directions according to the desired user programming.

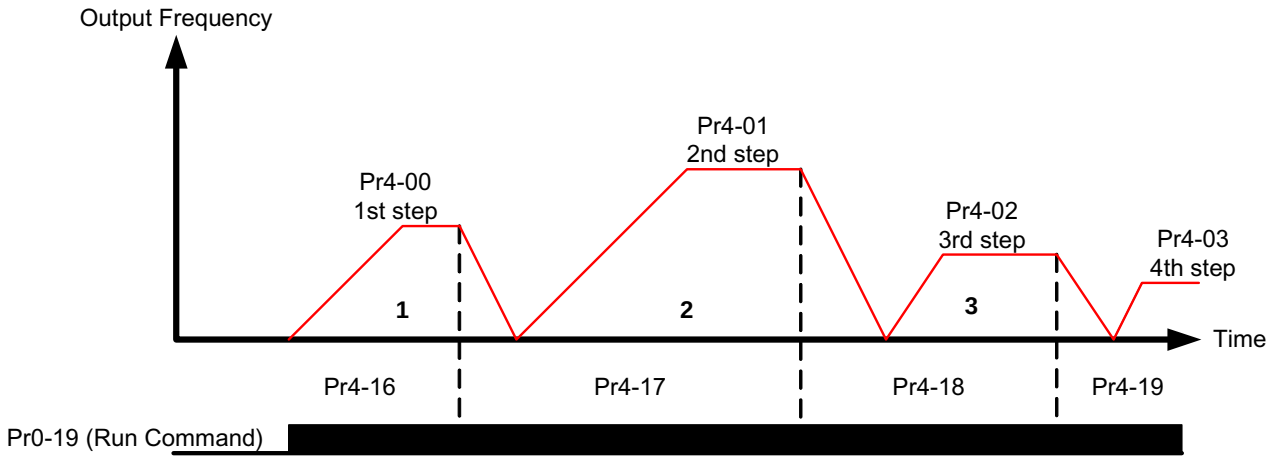
This parameter can be applied in the PLC Run operation of general small machines, food processing machines and washing equipment.

Example : Execute one cycle of the PLC Run program, Continue mode. The parameter settings are:

Parameter	Setting
Pr4-00~Pr4-14	The 1st to 15th step Frequency of PLC Run (sets the frequency of each speed)
Pr4-16~Pr4-30	The 1st to 15th step Duration of PLC Run (sets the Operation time of each step)
Pr4-32	The 1st to 15th step Operation Direction of PLC Run
Pr4-33	PLC Run Operation Mode (set to:b00000,Continue mode, direction by Pr4-32)
Pr4-34	PLC Run operation Cycle (Set to operate 1 cycle)
Pr4-35=16	What to do after PLC Run completed (Set to Stop)
Pr0-19= 3	Run Command setting (select from external signal (FWD or REV terminal)
Pr2-21=17	Multi-function output terminal setting (PLC Run running)
Pr2-22=19	Multi-function output terminal setting (A step of PLC Run completed)
Pr2-23=20	Multi-function output terminal setting (PLC Run completed)



Pr4-33 Bit 1 =0 Process Logic Control operation (PLC Run) Without zero intervals (Continue mode)



Pr4-33 Bit 1 =1 Process Logic Control operation (PLC Run) With zero intervals (Continue mode)

Bit 2

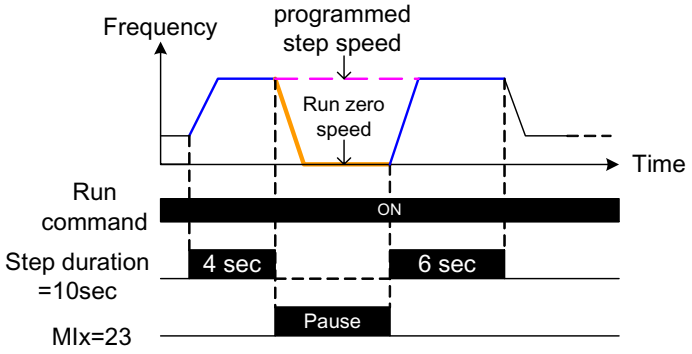
Bit 2=0: Run zero speed when PLC Run Paused.

When PLC Run Pause command is enabled, the drive will run zero speed, after PLC Run Pause command is disabled the drive will Re-Execute PLC Run from the point, which PLC Run paused.

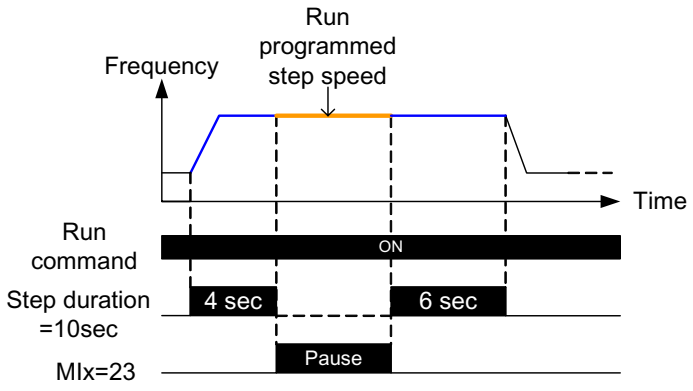
Bit 2=1 : Run original programmed step speed when PLC Run was Paused.

When PLC Run Pause command is enabled, the drive will run original programmed step speed, after PLC Run Pause command is disabled the drive will Re-Execute PLC Run from the point which PLC Run was paused.

User may set Multi-Function Digital Input Command (MIx) (Pr2-01~Pr2-06=23) as PLC Run Pause.



Pr4-33 Bit2=0: Run zero speed when PLC Run Paused



Pr4-33 Bit2=1: Run original programmed step speed when PLC Run Paused

Bit 3

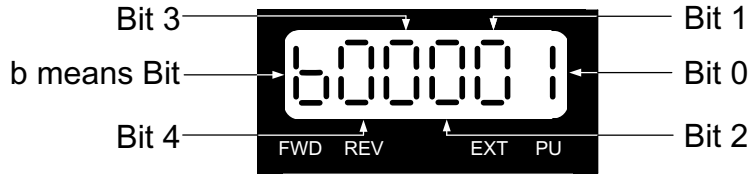
Bit 3=0 : Re-Execute PLC Run from step 0 after recovery from power interruption

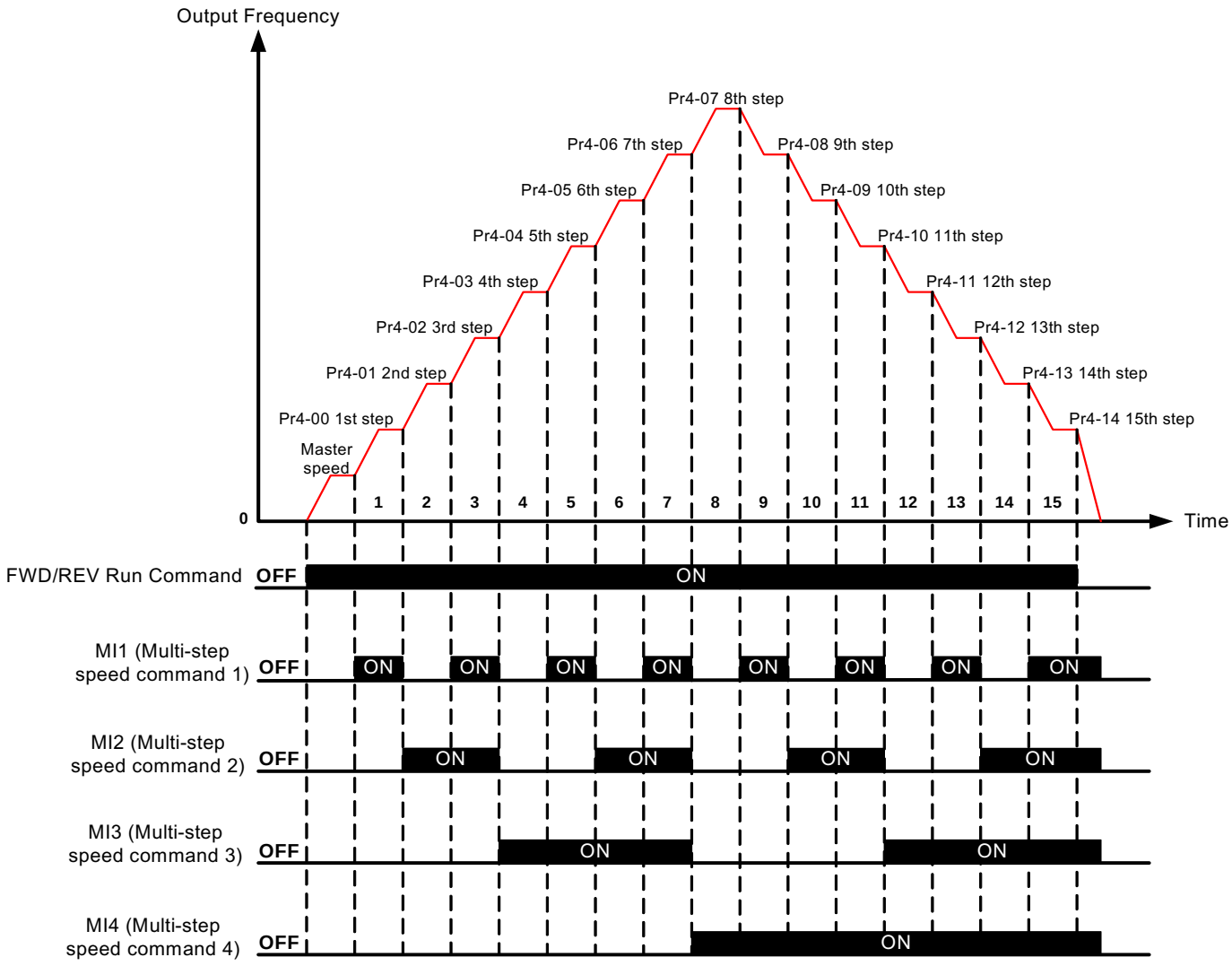
Bit 3=1 : Continue Execute PLC Run from the point which power interrupted after recovery from power interruption.

Pr4-34	PLC Run operation Cycle	Factory default	0
	Settings	0: PLC Run disabled	
		1~60000 : 1~60000 cycle	
		60001: Continuously execute program cycles	

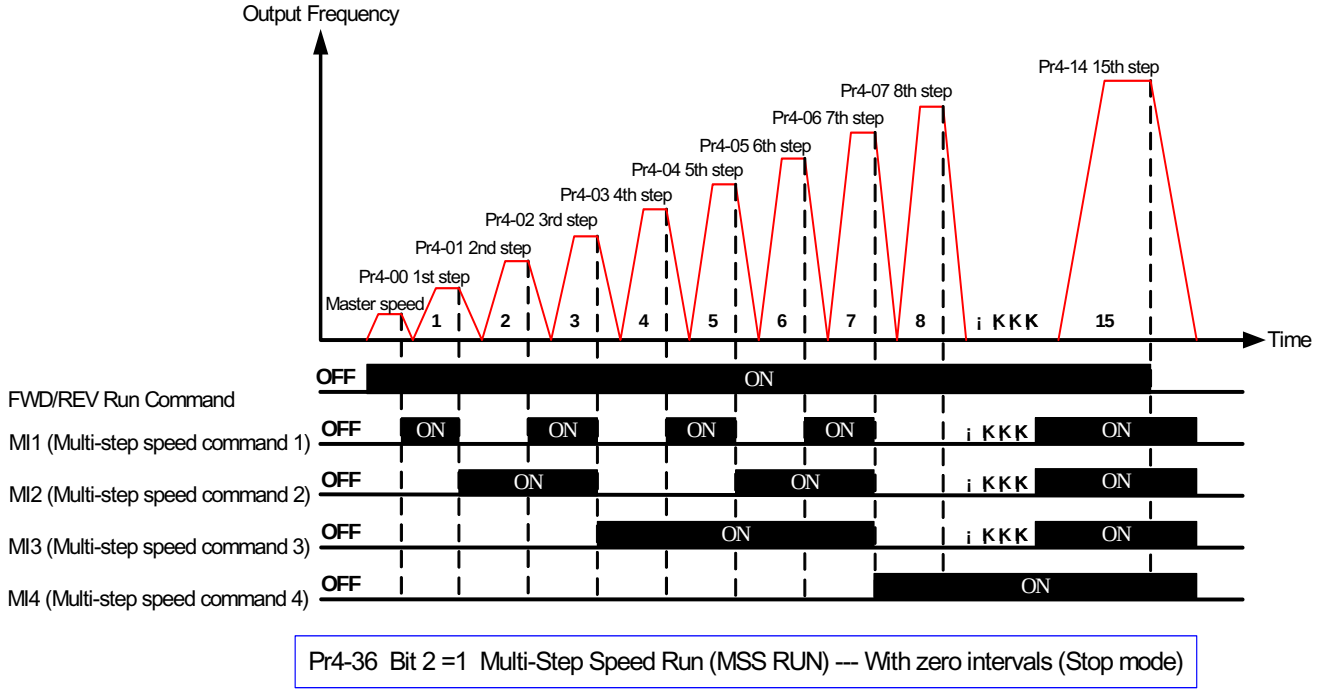
Pr4-35	What to do after PLC Run completed			
	Settings	0~15:step speed (0=master speed)	Factory default	16
		16:stop		

Pr4-36	Multi-Step Speed Run (MSS RUN) Operation Mode			Factory default	b00001
	Settings	Bit 0	0	Direction determined by Pr4-32	
			1	Direction determined by the master speed	
		Bit 1	0	Duration of MSS Run determined by Mix terminals.	
			1	Duration of MSS Run determined by Pr4-15~Pr4-30 setting.	
		Bit 2	0	Without zero intervals (Continue mode)	
			1	With zero intervals (Stop mode)	
		Bit 3	0	PID offset disabled	
			1	MSS Run + PID offset	





Pr4-36 Bit 2=0 Multi-Step Speed Run (MSS RUN) --- Without zero intervals (Continue mode)



Pr4-36 Bit 2 =1 Multi-Step Speed Run (MSS RUN) --- With zero intervals (Stop mode)

Group 5: Motor Parameters and Protection Parameters

Pr5-00	Full-Load Current of Motor 1	☒	Factory default	xxxA (100%)
	Settings	Amp (10~120% of drive's rated current)		

This parameter will limit the drive output current in order to prevent the motor from overheating. The value entered must be in Amperes, and should be set according to the rated current of the motor as indicated on the motor nameplate. Setting higher than motor nameplate can damage the motor. Setting higher than rated output of drive and damage the drive.

The Motor 1-electronic thermal protection function (Pr5-18, Pr5-19) is relative to this parameter.

Properly enter the Full-Load current according to the motor's nameplate before executing the Auto-Tuning (Pr5-05) to get optimal sensorless vector control results.

Pr5-01	Auto Torque Compensation of Motor 1			
	Settings	0.0~25.0%	Factory default	0.0

This parameter increases the amount of voltage the drive will output to the motor during operation to increase motor torque according to the actual load automatically.

Be careful when setting this parameter.

Always start at the lowest setting and increase the value until sufficient torque is achieved.

A large Torque Compensation may generate more voltage than needed and the motor will overheat and possibly be damaged.

Pr5-02	Slip Compensation of Motor 1	Factory default	0
	Settings	0~60 RPM	

While driving an asynchronous motor, an increasing load will cause an increase in slip. This parameter may be used to compensate the nominal slip within a range of 0~60 RPM. When the output current of the drive is higher than the motor's no-load current, the drive will adjust the

output frequency to the motor to compensate for slip. To obtain optimal slip compensation, execute the auto tune then get real rotor resistance of motor in Pr5-04.

Synchronous speed from 2 pole to 10 pole: (unit=RPM)

	2 Pole	4 Pole	6 Pole	8 Pole	10 Pole
50 Hz	3000	1500	1000	750	600
60 Hz	3600	1800	1200	900	720

Pr5-03	**Number of Motor Poles 1**		Factory default	4
	Settings	2~20		

This parameter sets the number of poles of connected motor (must be an even number).

Pr5-04	**Rotor Resistance R1 of Motor 1**			Factory default	0
	Settings	0.0~6553.5 mΩ			
Pr5-05	**Auto-tuning & control mode selection**				
	Settings	0	No function	Factory default	0
		1	To execute auto-tuning and switch to Sensorless vector control mode		
		2	Reset to V/F control mode		

This parameter determines the control mode of the drive:

This parameter automatically measures the motor's characteristics and enters the values into Pr05-01, Pr05-04, Pr1-07, respectively.

How to make motor Auto-Tuning and switch the drive to Sensorless Vector control mode?

step	What to do?
1	Make sure all parameter settings are at the Factory defaults and all power wiring is correct. The drive is in a Stopped condition and motor is stopped
2	To auto set V/F at Pr0-02 according to connected motor or enter the motor rated frequency in Pr1-01 and motor rated voltage in Pr1-02.
3	Enter motor Full-Load current in Pr5-00 according to the motor's nameplate.
4	Set Pr5-05 = 1, then press the "RUN" key on the keypad to execute the motor auto-tuning operation until "tunE" is displayed. (The execution time is about 0.5 to 2 minutes) **The drive is now switched to Sensorless Vector control mode.**
5	After the auto-tuning procedure is complete, verify the parameters (Pr5-01,Pr5-04,Pr1-07) have been updated. If not, set Pr5-05 = 1 and press the "RUN" key again.
6	Properly setting Slip Compensation of Motor in Pr5-02, may get optimal control result

Set Pr5-05 = 2 select reset to V/F control mode----**The drive is now switched to V/F mode**

User can design V/F ratio by requirement and control multiple motors simultaneously.

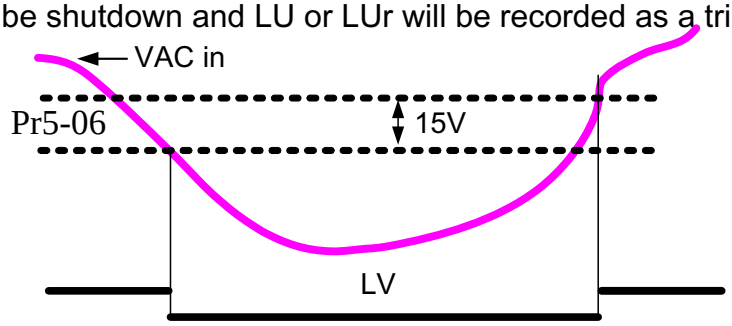
User can use PG card with Encoder to do close-loop speed control.

Note 1. The sensorless vector control mode is not intended for use with multiple motors connected to one drive simultaneously .

Note 2. If two motors will be connected to one drive and both must be auto tuned, it is necessary to set a multi-function input terminal to switch between Motors 1 and 2.
This will enable the drive to enter the calculated values into the correct parameter positions.

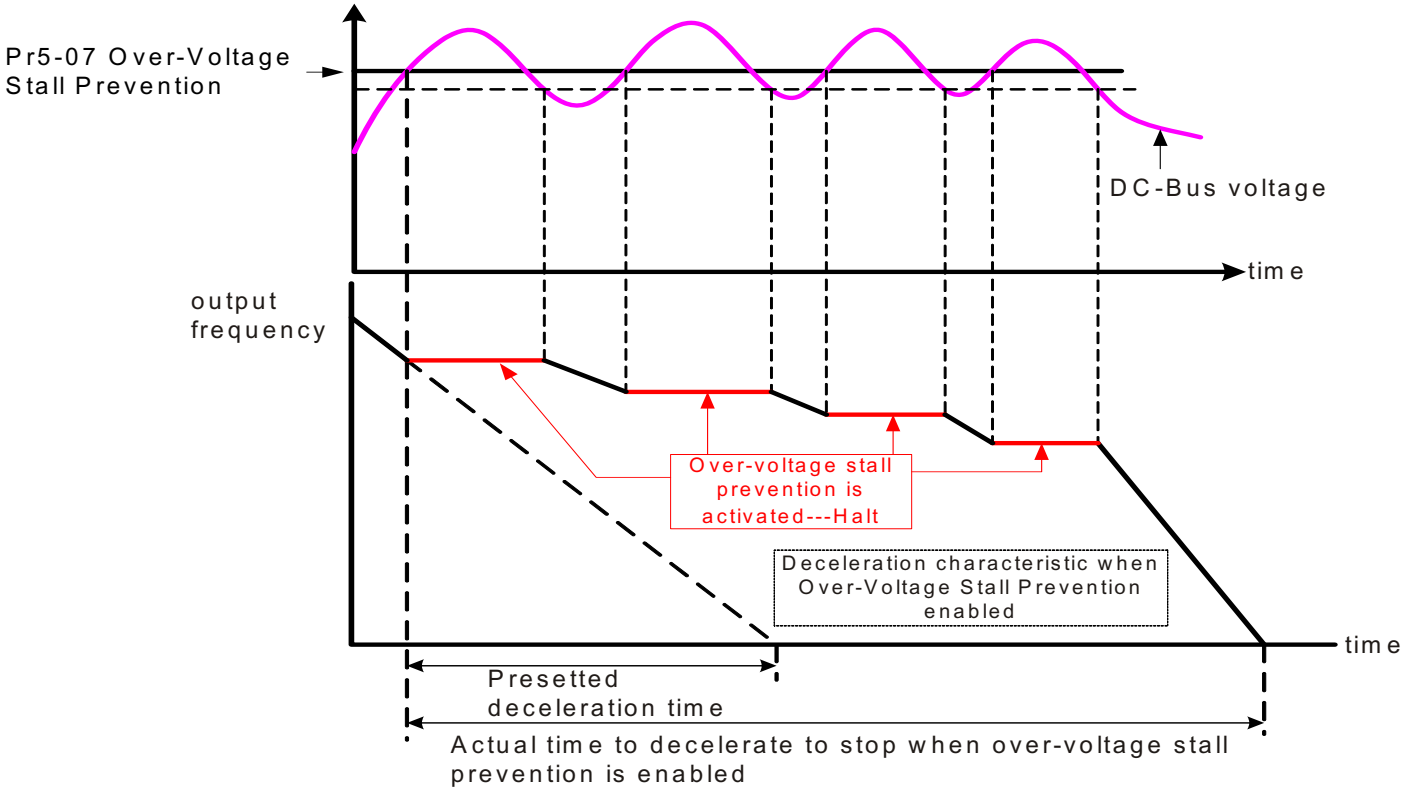
Pr5-06	Low Voltage Level			☒
230V models	Settings	160~220VAC	Factory default	180.0

This parameter determines the level for “LU” fault, when DC-BUS voltage is lower than this setting the drive will be shutdown and LU or LUr will be recorded as a trip record.



Pr5-07	Over-Voltage Stall Prevention Level			☒
230V models	Settings	320~500VDC	Factory default	380

During deceleration, the DC bus voltage may exceed its Maximum Allowable Value due to motor regeneration. When this function is enabled, the drive will not decelerate further and keep the output frequency constant until the voltage drops below the preset value again.



Pr5-08	Software Braking Level		Setting resolution	0.1
230V models	Settings	320~500VDC	Factory default	373

The action level of the braking resistor could be set by this parameter. The value must be higher than the steady state DC-BUS voltage; otherwise the braking transistor will have a 100% duty. At 100% duty the transistor and resistor will most likely fail.

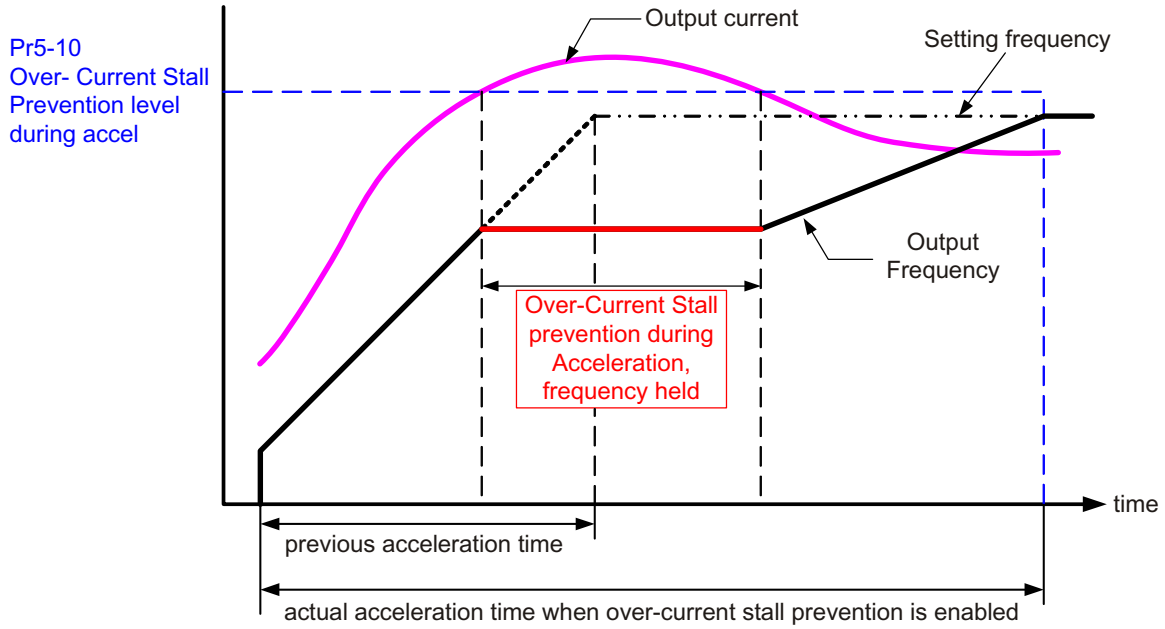
There are 4 parameters related to voltage level protection, they are Low Voltage Level (Pr5-06), Over-Voltage Stall Prevention Level (Pr5-07), Software Braking Level (Pr5-08), and Over Voltage protection Level. Only the Over Voltage protection Level is set by the factory, the others can all be set by the user, refer to table below.

	AC source (VAC)	Standard DC-Bus Level 100% (VDC)	Low Voltage Level 55% (Pr5-06) (VDC)	Software Braking Level 115% (Pr5-08) (VDC)	Over-Voltage Stall Prevention Level 117% (Pr5-07) (VDC)
230V Models	**200**	283	156	325	331
	220	311	171	358	364
	230	325	180	373	381
	240	339	187	390	397

Pr5-09	Factory Reserved			Factory default	0
	Settings	0	**Factory Reserved**		

Pr5-10	Over- Current Stall Prevention level during accel on the constant torque region			
	Settings	Amp (10~250% of drive's rated current)	Factory default	A (170%)

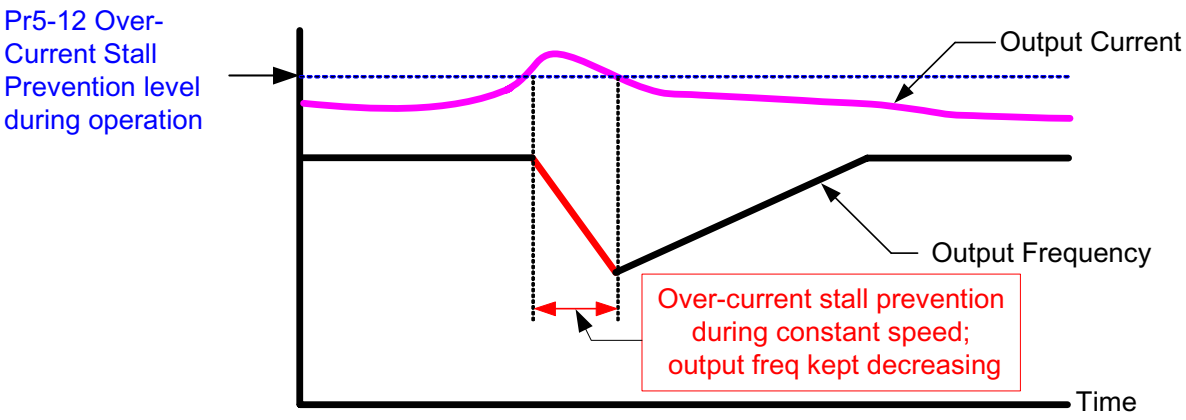
During acceleration, a heavy loaded motor may require very high current. If the output current increases abruptly and exceeds the value specified by Pr5-10 due to rapid acceleration, or excessive load on the motor. When this function is enabled, the drive will stop accelerating and keep the output frequency constant until the current drops below the set value, as shown in the graph below.



Pr5-11	Over- Current Stall Prevention low-limit level during accel on the constant power region			
	Settings	Amp (0~250% of drive's rated current)	Factory default	A(120%)

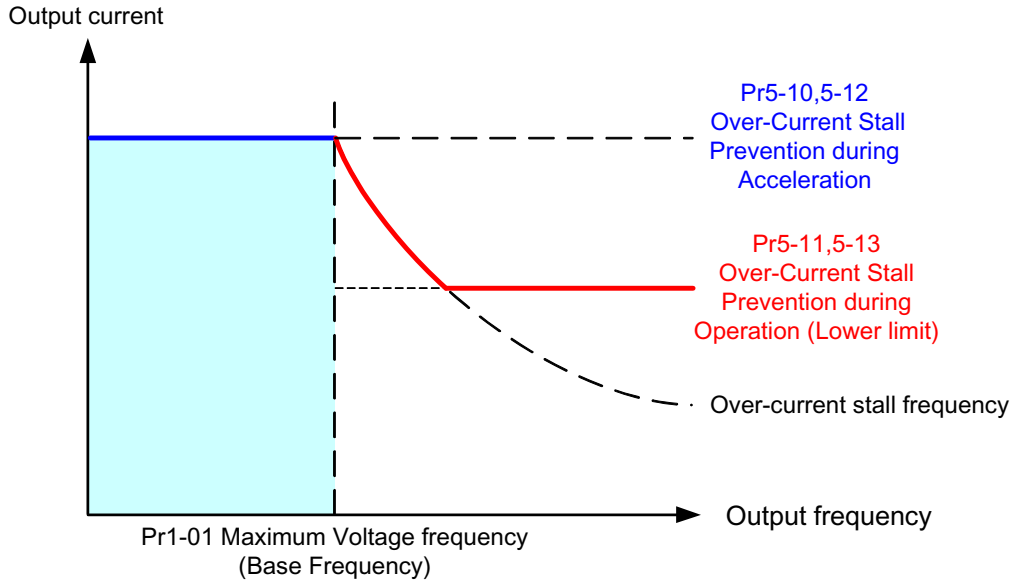
Pr5-12	Over-Current Stall Prevention level during constant speed on the constant torque region			
	Settings	Amp (10~250% of drive's rated current)	Factory default	A(170%)

This parameter sets the current limit for the Over-Current Stall Prevention during constant speed. If the load on the motor causes the current to rise above the value set in this parameter, the drive will lower its output frequency (therefore lowering current) to avoid the motor from stalling. After the current has fallen below the value set in Pr5-12, the drive will begin to bring the motor back to command speed as shown in the graph below.



Function of Over-Current Stall Prevention during Constant Speed

Pr5-13	Over- Current Stall Prevention low-limit level during constant speed run on the constant power region			
	Settings	Amp (0~250% of drive's rated current)	Factory default	A(120%)



Pr5-14	Over-Current Deceleration Time during Operation			Factory default	3.00
	Settings	0.050~600.00 Sec			
Pr5-15	Over-Torque Detection Selection 1 (ot1)			Factory default	0
	Settings	0	Disabled		
		1	Over-torque detection during constant speed operation, stop operation after detection.		
		2	Over-torque detection during constant speed operation, continue to operate after detection.		
		3	Over-torque detection during operation, stop operation after detection		
		4	Over-torque detection during operation, continue operation after detection.		

Pr5-16	Over-Torque Detection Level 1 (ot1)		Factory default	A(150%)
	Settings	Amp(20~250% of drive's rated current)		
Pr5-17	Over-Torque Detection Time 1 (ot1)		Factory default	0.1
	Settings	0.0~60.0 Sec		

These parameters define the current level and detection time for the Over Torque Detection 1 The Over Torque Detection level is a percentage of the rated drive current. The Factory default, Pr5-16, is 150% of the drive rated current.

The Over Torque Detection time is the length of time the drive may be in an over torque condition.

Example: When the output current exceeds the over torque detection level (Pr5-16) and exceeds the over torque detection time (Pr5-17), the drive will display ot1 on the keypad and will follow the setting in Pr5-15.

Pr5-18	Motor 1- Electronic Thermal Relay Selection (oL1)			Factory default	0
	Settings	0	Electronic thermal relay function disabled		
		1	Inverter duty motor (with independent cooling fan)		
		2	Standard motor (with shaft mounted cooling fan)		

This parameter selects the type of electronic thermal relay function based on the motor characteristics. When this function is disabled (0 is set), Pr5-19 is not working.

Inverter duty motor:

Windings designed for drive output and low speeds with high currents, and equipped with independent cooling fan. Then different output frequency will have the same operation time with 60Hz output, refer to below graph.

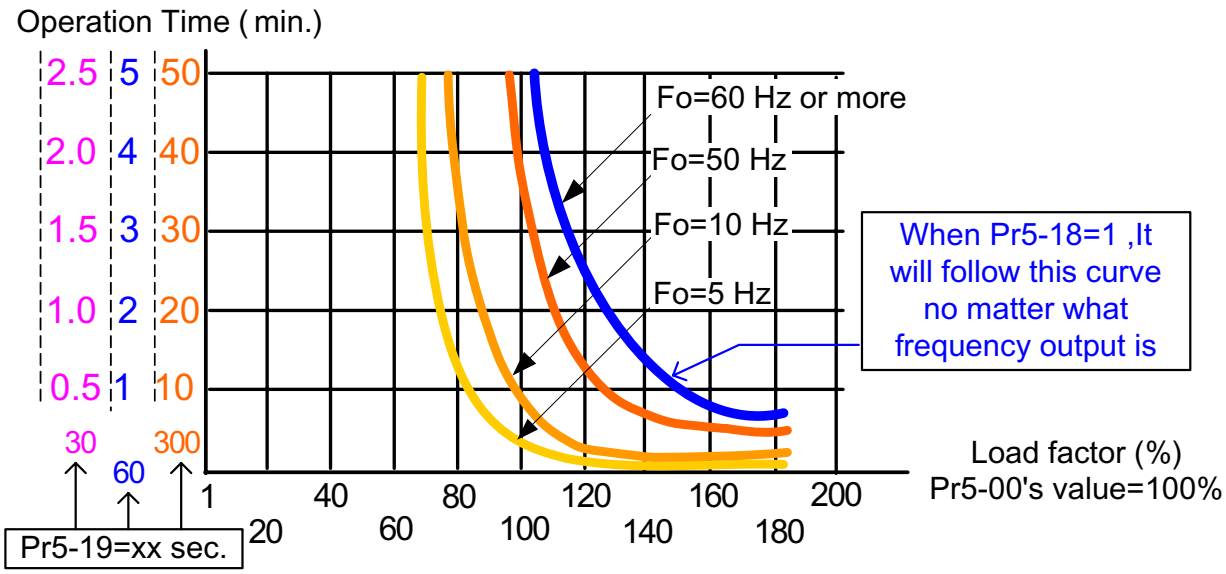
Standard motor:

Windings not designed for drive. Motor has a shaft mounted fan, which offers poor cooling at low speeds. Then different output frequency will have different operation time, refer to below graph.

Pr5-19	Motor 1- Electronic Thermal Relay Characteristic		Factory default	60
	Settings	30~600 Sec		

The parameter is set by the output frequency, current and operation time of the drive for activating the I^2t electronic thermal protection function. The graph below shows I^2t curves for 150% output power for 1 minute. oL1 will be recorded as an trip record when the Motor 1 electronic thermal protection function activated.

The electronic thermal relay function is designed to protect the motor from overheating, due to low output frequency and high currents.



Motor 1- Electronic Thermal Relay function (oL1)

Pr5-20	IGBT Over-Heat pre–warning setting (oH2)		Factory default	85.0
	Settings	0.0~110.0	Unit	

The setting for parameters Pr2-20~Pr2-23 = 21.

Pr5-21	Over-Torque Detection Selection 2 (ot2)		Factory default	0
	Settings	0	Disabled	
		1	Over-torque detection during constant speed Operation, stop operation after detection.	
		2	Over-torque detection during constant speed operation, continue to operate after detection.	
		3	Over-torque detection during entire (acceleration, steady state, deceleration) operation, stop operation after detection	
		4	Over-torque detection during entire (acceleration, steady state, deceleration) operation, continue operation after detection.	

This parameter is the same with Pr5-15.

Pr5-22	Over-Torque Detection Level 2 (ot2)	♦	Factory default	A(150%)
	Settings	Amp(20~250% of drive's rated current)		
Pr5-23	Over-Torque Detection Time 2 (ot2)	♦	Factory default	0.1
	Settings	0.0~60.0 Sec		

Pr5-15 and Pr5-21 determine the operation mode of the drive after the over-torque is detected via the following method: if the output current exceeds the over-torque detection level 1 (Pr5-16) and also exceeds the Pr5-17 Over-Torque Detection Time 1, the fault code "ot1/ot2" is displayed. If a Multi-Functional Output Terminal is to over-torque detection, the output is on. Please refer to Pr2-20~Pr2-23 for details.

Pr5-24	[Pr5-21]	Most Recent Fault Record	Factory default	0	
Pr5-25	[Pr5-22]	2nd Most Recent Fault Record	Factory default	0	
Pr5-26	[Pr5-23]	3rd Most Recent Fault Record	Factory default	0	
Pr5-27	[Pr5-24]	4th Most Recent Fault Record	Factory default	0	
Pr5-28	5th Most Recent Fault Record		Factory default	0	♦
Pr5-29	6th Most Recent Fault Record		Factory default	0	♦
Pr5-30	7th Most Recent Fault Record		Factory default	0	♦
Pr5-31	8th Most Recent Fault Record		Factory default	0	♦
Pr5-32	9th Most Recent Fault Record		Factory default	0	♦
Pr5-33	10th Most Recent Fault Record		Factory default	0	♦

Pr5-34	**11th Most Recent Fault Record**		Factory default	0	♦
Pr5-35	**12th Most Recent Fault Record**		Factory default	0	♦
Pr5-36	**13th Most Recent Fault Record**		Factory default	0	♦
Pr5-37	**14th Most Recent Fault Record**		Factory default	0	♦
Pr5-38	**15th Most Recent Fault Record**		Factory default	0	♦
Pr5-39	**16th Most Recent Fault Record**		Factory default	0	♦

Settings	0	no fault		1	oC (over-current)		
	2	oU (over-voltage)		3	GF (ground fault)		
	4	SC (IGBT failure)		5	oL (drive overload)		
	6	oL1 (electronic thermal relay 1)		7	ot1 (Over-Torque1)		
	8	oCn (over-current during constant speed)		9	oCA (over-current during accel.)		
	10	oCd (over-current during decel.)		11	EP1 (EPROM error 1)		
	12	EP2 (EPROM error 2)		13	EF (external fault)		
	14	Ct1 (current sensor 1)		15	Ct2 (current sensor 2)		
	16	HPF (protection circuit fault)		17	oH1 (IGBT overheat)		
	18	oH2 (Heatsink overheat)		19	SoFt (Pre-charge circuit error)		
	20	ACI. (ACI error)		21	ASC (RS-485 error)		
	22	PI.d (PID error)		23	Pu(Keypad communication overtime)		
	24	tunE (Auto tuning failure)		25	bF (braking chopper failure)		
	26	PG (PG error)		27	PHL (Phase loss)		
	28	CC (current signal error during stop		29	CPu (CPU error)		
	30	FAn (Fan failure)		31	AnI fault (Analog input error)		
	32	ot2 (Over-Torque2)	♦	33	oL2 (electronic thermal relay 2)		♦
	34	rnot (Motor selection error)	♦	36	LUr (Low Voltage during Run)		♦
	37	oUd (over-voltage during decel)		38	`x CoPY (Parameter copy error)		♦
	39	LU (Low Voltage)		40	bb (External Base Block)		

Pr5-40	**Full-Load Current of Motor 2**	☒	Factory default	xxxA (100%)
♦	Settings	Amp (10~120% of drive's rated current)		

This parameter will limit the drive output current in order to prevent the motor from overheating. The value entered must be in Amperes, and should be set according to the rated current of the motor as indicated on the motor nameplate. The factory default is the rated output current of the drive.

The Motor 2-electronic thermal protection function (Pr5-45~Pr5-46) is related to this parameter. Properly enter the Full-Load current according to the motor's nameplate before executing the Auto-Tuning (Pr5-05) to get optimal sensorless vector control result.

Pr5-41	**Auto Torque Compensation of Motor 2**			
♦	Settings	0.0~25.0%	Factory default	0.0

This parameter increases the amount of voltage the drive will output to the motor during operation to increase motor torque according to the actual load automatically.

Be careful when setting this parameter.
Always start at the lowest setting and increase the value until sufficient torque is achieved.
A large Torque Compensation may generate more voltage than needed and the motor will overheat and possibly be damaged.

Pr5-42	Slip Compensation of Motor 2	Factory default	0
♦	Settings	0~60 RPM	

While driving an asynchronous motor, an increasing load will cause an increase in slip. This parameter may be used to compensate the nominal slip within a range of 0~60 RPM. When the output current of the drive is higher than the motor's no-load current, the drive will adjust the output frequency to the motor to compensate for slip.

Note 1. If the motor's no-load current > the rated current of the motor, the slip compensation will not work correctly.

Note 2. To obtain optimal slip compensation, execute the auto tune then get real rotor resistance of motor in Pr5-44.

Synchronous speed from 2 pole to 10 pole: (unit=RPM)

	2 Pole	4 Pole	6 Pole	8 Pole	10 Pole
50 Hz	3000	1500	1000	750	600
60 Hz	3600	1800	1200	900	720

Pr5-43	Number of Motor Poles 2	Factory default	4
♦	Settings	2~20	

This parameter sets the number of poles of connected motor (must be an even number).

Pr5-44	Rotor Resistance R1 of Motor 2		Factory default	0
♦	Settings	0.0~6553.5 mΩ		
Pr5-45	**Motor 2- Electronic Thermal Relay Selection (oL2)**		Factory default	0
♦	Settings	0	Electronic thermal relay function disabled	
		1	Inverter duty motor (with independent cooling fan)	
		2	Standard motor (with shaft mounted cooling fan)	

This parameter selects the type of electronic thermal relay function based on the motor characteristics. When this function is disabled (0 is set), Pr5-46 is not working.

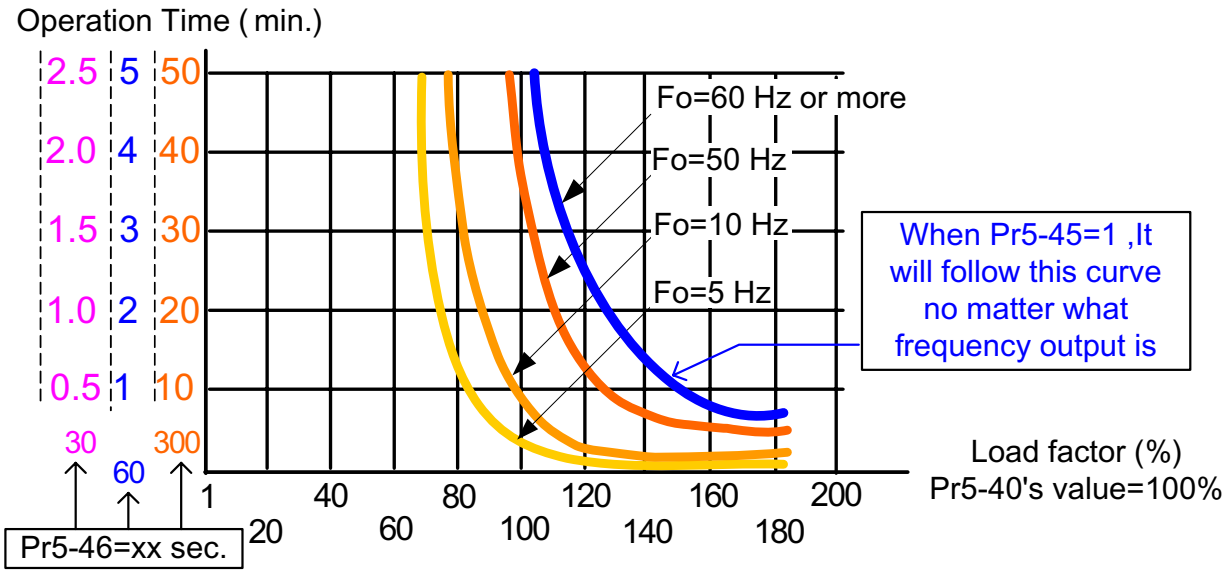
Inverter duty motor : Windings designed for drive output and low speeds with high currents, and equipped with independent cooling fan then different output frequency will have the same operation time with 60Hz output, refer to below graph.

Standard motor : Windings not designed for drive. Motor has a shaft mounted fan which offers poor cooling at low speeds, then different output frequency will have different operation time, refer to below graph.

Pr5-46	Motor 2- Electronic Thermal Relay Characteristic	Factory default	60
♦	Settings	30~600 Sec	

The parameter is set by the output frequency, current and operation time of the drive for activating the I^2t electronic thermal protection function. The graph below shows I^2t curves for 150% output power for 1 minute. oL2 will be recorded as a trip record when the Motor 2-electronic thermal protection function activated.

The electronic thermal relay function is designed to protect the motor from overheating, due to low output frequency and high currents.



Motor 2- Electronic Thermal Relay function (oL2)

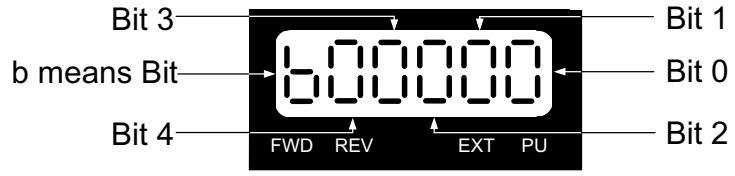
Pr5-47	Heatsink Over-Heat pre–warning setting (oH2)		Factory default	85.0
♦	Settings	0.0~110.0 °C	unit	°C

The setting for parameters Pr2-20~Pr2-23 = 31.

Pr5-48	Delay Time for Motor Selection		Factory default	0.05
♦	Settings	0.00~60.00 Sec		

It is used to set the switch delay time of Motor Selection

Pr5-49	Motor selection mode			Factory default	b00000
♦	Settings	Bit 0	0	Cannot be switched during operation.	
			1	Can be switched during operation.	
		Bit 1	0	No need to wait for confirmation signal when switching	
			1	Need to wait for confirmation signal when switching	



User may execute Motor selection and switch VF1 to VF2 and its relative motor parameters by using Pr5-48, Pr5-49 and setting parameters as below :

1-Set the MIx terminal (Pr2-01~Pr2-06) to 42—As a Motor selection command

2-Set the MIx terminal (Pr2-01~Pr2-06) to 43—As a Confirm signal of Motor selection

3-Set the MOx terminal (Pr2-20~Pr2-2) to 32—As a Motor selection output

This motor selection function has 2 main applications:

A: Y-Δ connection change in a motor and B: switch between 2 motors

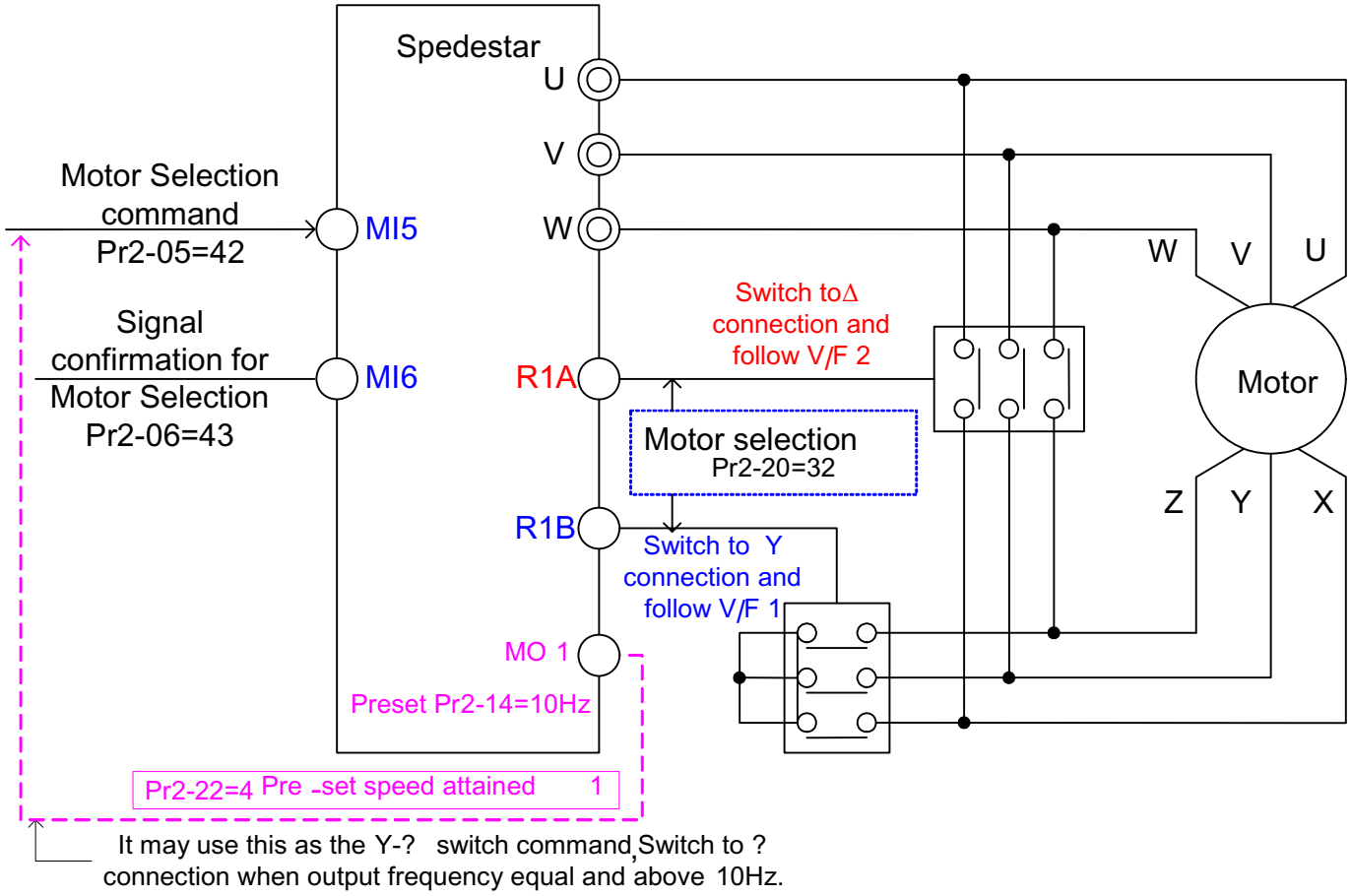
A: Y-Δ connection change in a motor:

The drive will follow setting on Pr5-48 ~ Pr5-49 to switch the motor winding Y or Δ and select V/F 1 or V/F 2 as well as its relative motor parameters

Y- connection switch: can be used for wide range motor

Y connection for low speed: higher torque can be used for rigid tapping

Δ connection for high speed: higher torque can be used for high-speed drilling



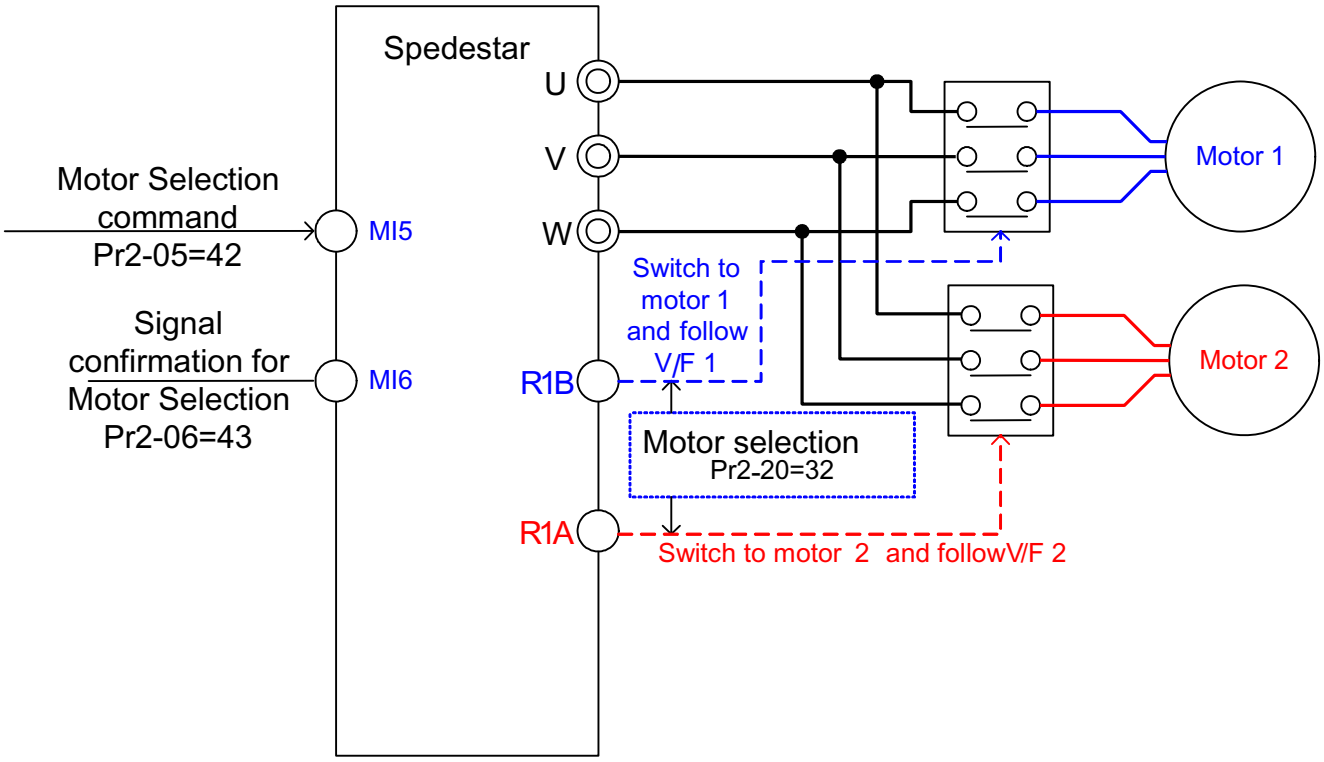
As shown above:

When MI5 (Pr2-05=42-- As a Motor selection command) is enabled, when switched to Δ connection, drive will operate by V/F 2.

If set Pr5-49 Bit 0=1 (Can be switched during operation.),drive will execute speed search.

B: switch between 2 motors:

The drive will follow setting on Pr5-48 and Pr5-49 to select motor 1 or motor 2 to be used, and select V/F 1 or V/F 2 as well as its relative motor parameters simultaneously.



As shown above: When MI5 (Pr2-05=42-- As a Motor selection command) is enabled, when switched to motor 2, drive will operate by V/F 2.

If Pr5-49 Bit 0 should set to 0 (Cannot be switched during operation).

Group 6: Special Parameters

Pr6-00	DC Braking Current Level		Factory default	A(0%)
	Settings	Amp (0~50% of drive's rated current)		

This parameter sets the level of DC Braking Current output to the motor during start-up and stopping. When setting DC Braking Current, the Rated Current (Pr0-01) is regarded as 100%. It is recommended to start with a low DC Braking Current Level and then increase until proper holding torque has been achieved. A current level too high may damage the motor.

Pr6-01	DC Braking Time during Start-up		Factory default	0.00
	Settings	0.00~60.00 Sec		

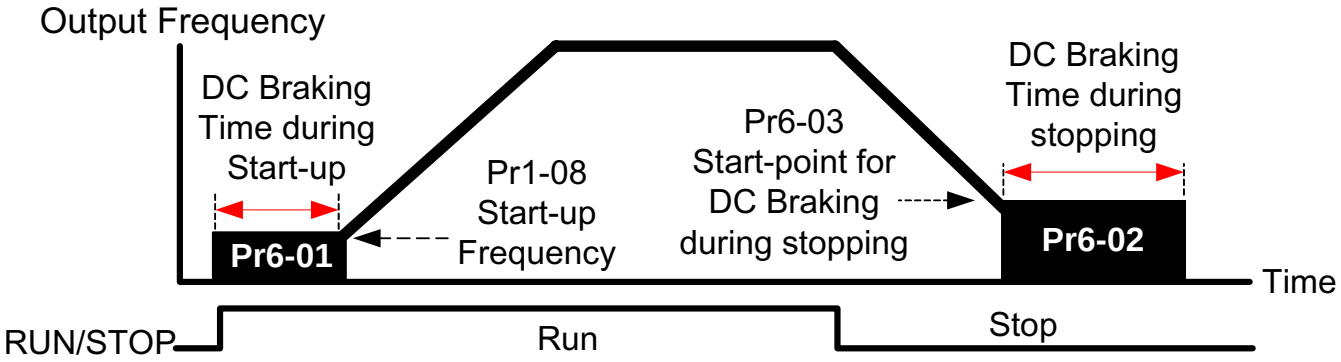
This parameter determines the duration of the DC Braking current after a RUN command. When the time has elapsed, the drive will start accelerating from the Start-up frequency (Pr1-08).

Pr6-02	DC Braking Time during stopping	Factory default	0.00
	Settings 0.00~60.00 Sec		

This parameter determines the duration of the DC Braking current during stopping. If stopping with DC Braking is desired, Pr0-20 Stop Method must be set to Ramp to Stop.
This is often used to hold a motor shaft in position for a short time.

Pr6-03	Start-point for DC Braking during stopping	Factory default	0.00
	Settings 0.00~600.00 Hz		

This parameter determines the frequency when DC Braking will begin during deceleration.



The Procedural Diagram of the DC Braking

DC Braking during Start-up is used for loads that may move before the AC drive starts, such as fans and pumps. Under such circumstances, DC Braking can be used to hold the load in position before setting it in motion.

DC Braking during stopping is used to shorten the stopping time and also to hold a stopped load in position. For high inertia loads, a brake resistor for dynamic braking may also be needed for fast decelerations. For the best stopping performance, it is recommended to use the Deceleration Time to slow the motor and then apply the DC brake at speeds below 25 Hz.

Pr6-04	Increasing Rate of the DC Braking Voltage	Factory default	50.00%
	Settings 0.01~300.00%		

This parameter determines the rate of increase for the DC voltage output during the DC braking function.

Pr6-05	Momentary Power Loss Operation Selection		Factory default	0
	Settings	0	Operation stops after momentary power loss.	
		1	Operation continues after momentary power loss, speed search starts with Last Output frequency Downward	
		2	Operation continues after momentary power loss, speed search starts with the Start-up frequency Upward	

This parameter determines the operation mode when the drive restarts after a momentary power loss.

In PG control mode, the drive will execute the speed search function automatically by the PG speed when this setting isn't set to 0.

Pr6-06	Maximum Allowable Power Loss Time	Factory default	2.0
	Settings	0.1~5.0 Sec	

If the duration of a power loss is less than this parameter setting, the drive will resume operation. If it exceeds this parameter setting, the drive output is then turned off (coast stop).

The selected operation after power loss in Pr6-05 is only executed when the maximum allowable power loss time is ≤5 seconds and the drive displays “LU”. But if the drive is powered off due to overload, even if the maximum allowable power loss time is ≤5 seconds, the operation mode as set in Pr6-05 is not executed. In that case it starts up normally.

Pr6-07	Base-Block Time for Speed Search (BB)	Factory default	0.5
	Settings	0.1~5.0 Sec	

When momentary power loss is detected, the drive will block its output and then wait for a specified period of time (determined by Pr6-07, called Base-Block Time) before resuming operation. This parameter should be set at a value to ensure that any residual regeneration voltage from the motor on the output has disappeared before the drive is activated again.

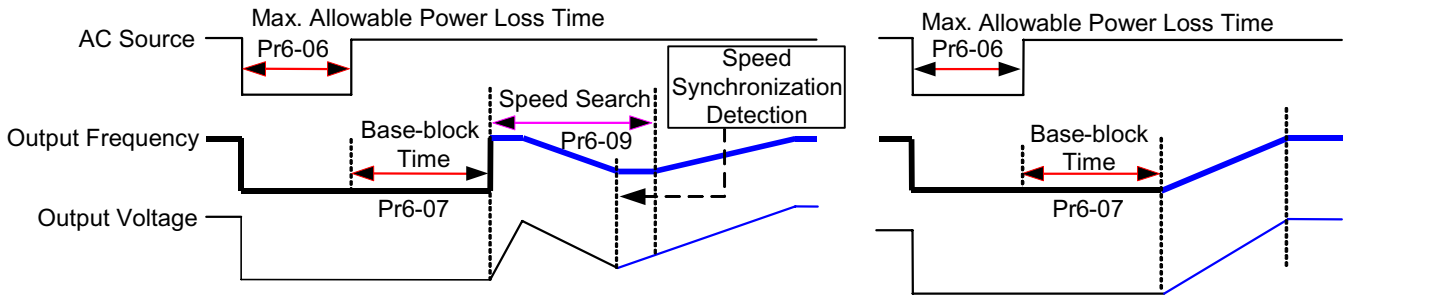
This parameter also determines the waiting time before resuming operation after External Base-block and Auto Restart after Fault (Pr6-10).

Pr6-08	Maximum Current Level for Speed Search	Factory default	A(120%)
	Settings	Amp(20~200% of drive’s rated current)	

Following a momentary power loss, the drive will start its speed search operation only if the output current is greater than the value set in this parameter. When the output current is less than the value set in this parameter, the drive output frequency is at “speed synchronization point”. The drive will start to accelerate or decelerate back to the operating frequency at which it was running prior to the power loss.

When speed search is executed, the drive will follow the V/F curve determined by parameter group.

This parameter is used for both the “Auto Acceleration/Deceleration Time” and “Speed Search” functions.



Pr6-05=1 begins search from Last Output Frequency Downward Pr6-05=2 begin search from Start-up frequency Upward

Procedure Diagram “ Restart after Momentary Power”

Pr6-09	Deceleration Time for Speed Search	Factory default	3.00
	Settings	0.50~120.00 Sec	

This parameter determines the rate at which the drive will decelerate the output frequency to find the motor speed, during the momentary speed search method “begins from command frequency”.

When speed search is executed, the Auto Deceleration and the S curve deceleration will not be conducted.

Pr6-10	Auto Restart after Fault	Factory default	0
	Settings	0~10 times	

Only after an over-current OC or over-voltage OV fault occurs, the AC motor drive can be reset/restarted automatically up to 10 times. If fault occurred times exceed Pr6-10 setting, the drive will reject to restart and Need to be reset by users to keep running.

Setting this parameter to 0 will disable the reset/restart operation after any fault has occurred. If this parameter is set to 8 and 3 faults occur, the remaining number of faults for auto restart is 5. If there are no more faults within 10 minutes, the drive will reset this parameter to 8.

When enabled, the drive will restart with speed search, which starts at the frequency before the fault. To set the waiting time before restart after a fault, please set Pr6-07 Base-Block Time for Speed Search.

Pr6-11	Speed Search during Start-up			Factory default	0
	Settings	0	speed search disabled		
		1	speed search through the frequency command		
		2	FWD-speed search only (motor only runs in FWD direction)		
		3	REV-speed search only (motor only runs in REV direction)		
		4	FWD/REV speed search enabled in both directions (FWD first)		
		5	REV/FWD speed search enabled in both directions (REV first)		

This parameter is used for starting and stopping a motor with high inertia such as a Large Punch Press machine, blower..etc. A motor with high inertia normally stopped, using the “Coast to Stop” method, it takes 2~5 minutes to stop completely. By setting this parameter, the user does not need to wait for the motor to come to a complete stop before restarting the drive. Please refer to Pr6-08 and Pr6-09

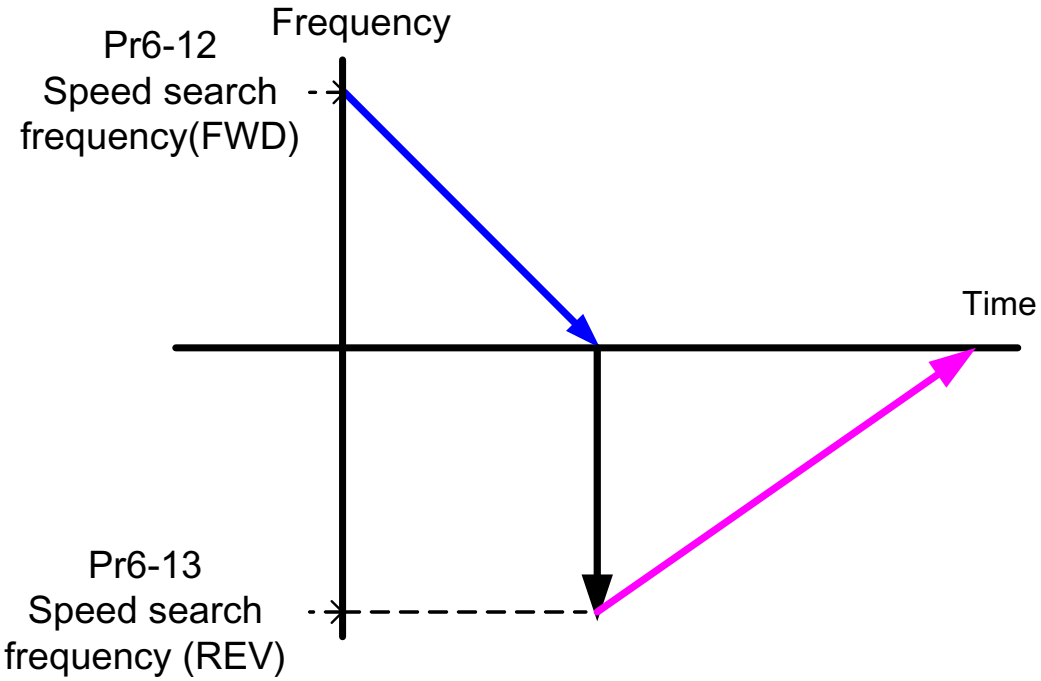
If a PG card and encoder is used on the drive and motor, then the speed search will start from the speed that is detected by the encoder and accelerate quickly to the commanded frequency. In PG control mode, the drive will execute the speed search function automatically by the PG speed when this setting isn’t set to 0.

Pr6-12	Speed Search Frequency (FWD direction)	Factory default	60.00/50.00
	Settings	0.00~600.00 Hz	

This parameter is used as the frequency start point for the Speed Search function, when Pr6-11 is set to 2 or 4 and not in PG control mode.

Pr6-13	Speed Search Frequency (REV direction)	Factory default	60.00/50.00
	Settings	0.00~600.00 Hz	

This parameter is used as the frequency start point for the Speed Search function when Pr6-11 is set to 3 or 5 and not in PG control mode.

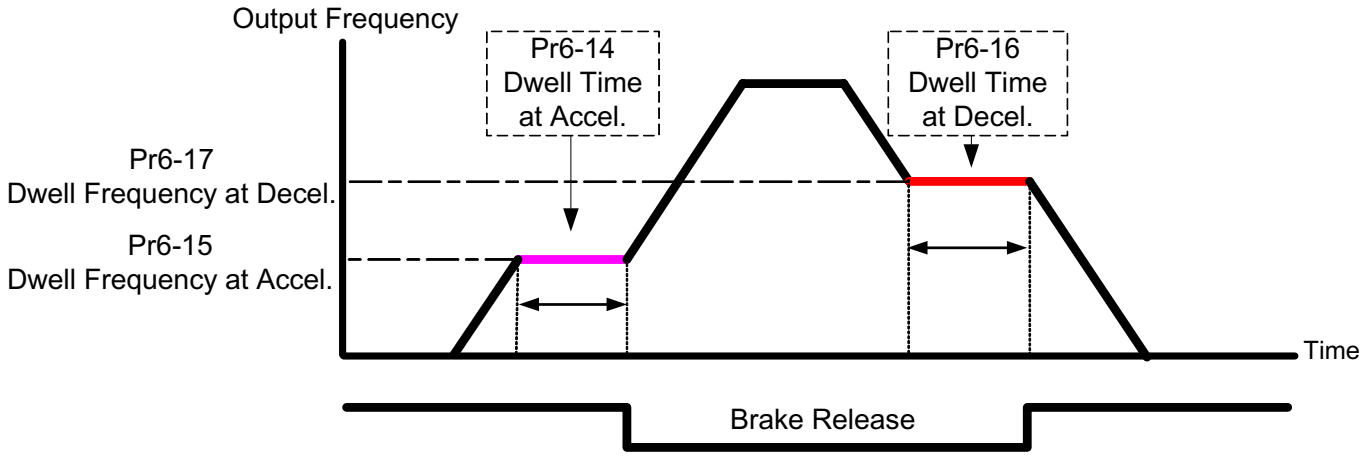


Pr6-11=4 FWD/REV speed search enabled in both directions (FWD first)

Pr6-14	Dwell Time at Accel.	Factory default	0.00
	Settings	0.00~60.00 Sec	
Pr6-15	Dwell Frequency at Accel.	Factory default	6.00
	Settings	0.00~600.00 Hz	
Pr6-16	Dwell Time at Decel.	Factory default	0.00
	Settings	0.00~60.00 Sec	
Pr6-17	Dwell Frequency at Decel.	Factory default	6.00
	Settings	0.00~600.00 Hz	
Pr6-18	Dwell Frequency current	Factory default	A(0%)
	Settings	Amp (0~150% of rated current)	

These parameters determine the time and frequency point for the drive to stop, accel or decel to allow the motor to catch up to the drive output frequency. This is commonly used with heavily loaded applications where the motors rotor is lagging behind the stator. In heavily loaded situations, Dwell can make stable output frequency temporarily to prevent OU or OC errors. If the Multi-Function output terminal is set to control the mechanical brake. You will get superior performance in vertical moving equipment such like Lift, Hoist and Elevator…etc.

Pr6-18 sets the motor current in Dwell execution, it is valid only in V/F control mode.



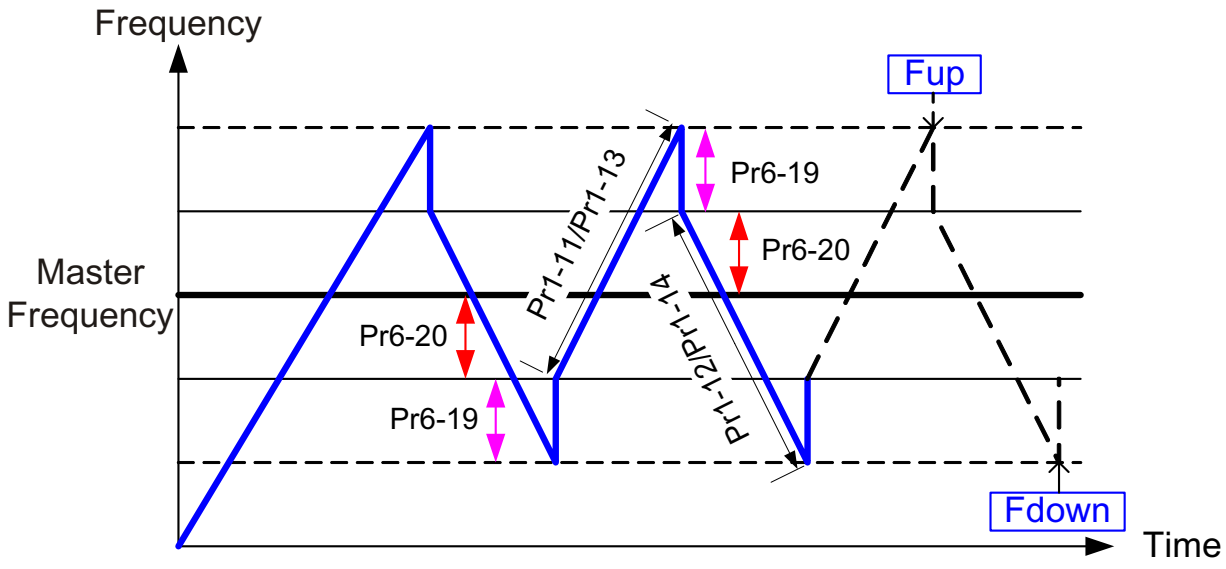
Dwell Acceleraion/Deceleration & mechanical brake

Pr6-19	**Traverse Skip Frequency**	Factory default	0.00
	Settings 0.00~100.00Hz		
Pr6-20	**The Amplitude of traverse**	Factory default	0.00
	Settings 0.00~200.00Hz		

The frequency change will be as shown in the following diagram. These two parameters are specific for textile machine.

Frequency of Δ top point: Fup= master frequency + (Pr6-19)+(Pr6-20)

Frequency of Δ down point: Fdown= master frequency - (Pr6-19)–(Pr6-20)



Group 7: High-function Parameters (PID and Communication)

Pr7-00	Proportional Gain (P)		Factory default	80.0
	Settings	0.0~500.0%		

This parameter determines the gain of the feedback loop. If the gain is large, the response will be strong and immediate (If the gain is too large, vibration may occur). If the gain is small, the response will be weak and slow.

This parameter specifies proportional control and associated gain (P). If the other two gains (I and D) are set to zero, proportional control is the only one effective. With 10% deviation (error) and P=1, the output will be P x10% x Master Frequency.

Pr7-01	Integral Time (I)		Factory default	1.00
	Settings	0.00~100.00 Sec		
		0.00:no integral		

This parameter determines the speed of response for the PID feedback loop. If the integral time is long, the response will be slow. If the integral time is short, the response will be quick. Be careful not to set (I) too small, since a rapid response may cause oscillation in the PID loop.

This parameter specifies integral control (continual sum of the deviation) and associated gain(I). When the integral gain is set to 1 and the deviation is fixed, the output is equal to the input (deviation) once the integral time setting is attained. If the integral time is set as 0.00, Pr7-01 will be disabled.

Pr7-02	Derivative Control (D)		Factory default	0.00
	Settings	0.00~5.00 Sec		

This parameter determines the damping effect for the PID feedback loop. If the differential time is long, any oscillation will quickly subside. If the differential time is short, the oscillation will subside slowly.

With this parameter set to 1, the PID output is equal to differential time x (present deviation − previous deviation). It increases the response speed but it may cause overcompensation.

Pr7-03	Upper limit for Integral Control		Factory default	100.0
	Settings	0.0~100.0%		

This parameter defines an upper bound or limit for the integral gain (I) and therefore limits the Master Frequency. During a fast Integration response, it is possible for the frequency to spike beyond a reasonable point. This parameter will limit this frequency spike.

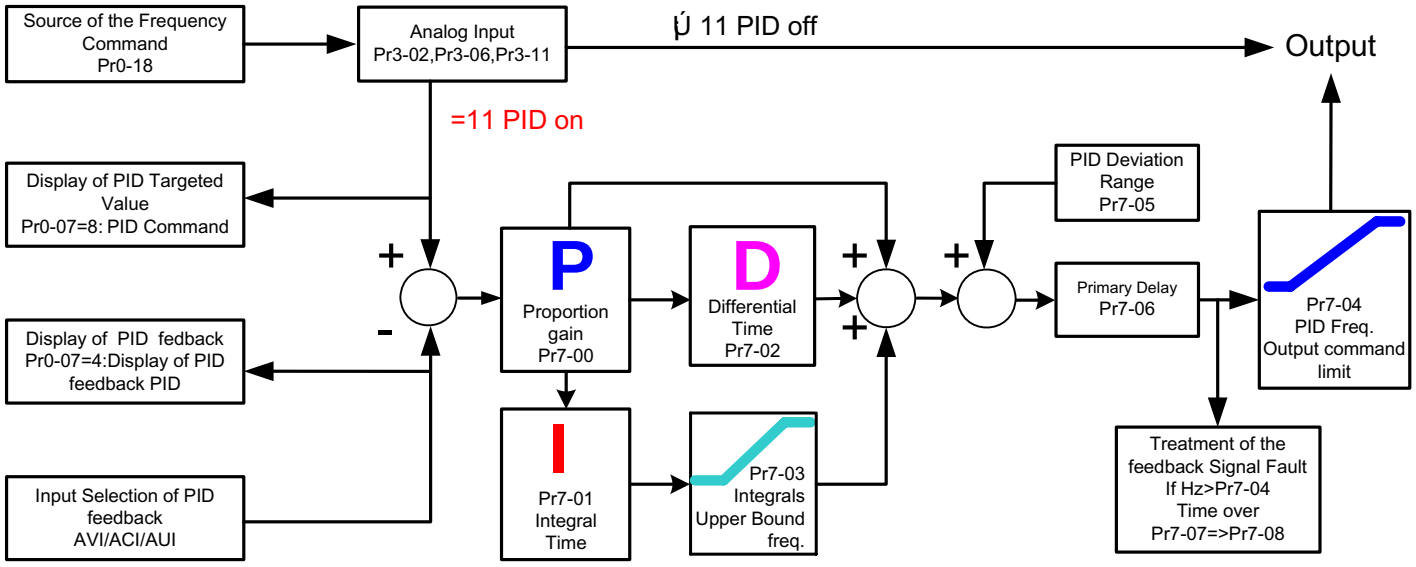
The formula is: Integral upper bound = Maximum Operation Frequency (Pr1-00) x (Pr7-03).

This parameter can limit the Maximum Output Frequency.

Pr7-04	PID Output Frequency Limit	Factory default	100.0
	Settings 0.0~100.0%		

This parameter determines the limit of the PID Command frequency. The maximum output frequency while in the PID operation will be (Pr1-00 x Pr7-04). This parameter will limit the Maximum Output Frequency.

Pr7-05	PID Offset	Factory default	0.0
	Settings -100.0~+100.0%		
Pr7-06	**Primary Delay Filter Time**	Factory default	0.000
	Settings 0.000~0.100 Sec		



PI Control: controlled by the P action only, and thus, the deviation cannot be eliminated entirely. To eliminate residual deviations, the P + I control will generally be utilized. And when the PI control is utilized, it could eliminate the deviation incurred by the targeted value changes and the constant external interferences. However, if the I action is excessively powerful, it will delay the responding toward the swift variation. The P action could be used solely on the loading system that possesses the integral components.

PD Control: when deviation occurs, the system will immediately generate some operation load that is higher than the load generated single handedly by the D action to restrain the increment of the deviation. If the deviation is small, the effectiveness of the P action will be decreasing as well. The control objects include occasions with integral component loads, which are controlled by the P action only, and sometimes, if the integral component is functioning, the whole system will be vibrating. On such occasions, in order to make the P action's vibration subside and the system stabilize, the PD control could be utilized. In other words, this control is good for use with loads with no braking functions over the processes.

PID Control: Utilize the I action to eliminate the deviation and the D action to restrain the vibration, thereafter, combine with the P action to construct the PID control. Use of the PID method could obtain a control process with no deviations, high accuracies and a stable system.

Pr7-07	PID Feedback Signal Detection Time	Factory default	0.0
	Settings	0.0~6000.0 Sec	

This parameter defines the time during which the PID feedback must be abnormal before a warning is given. It also can be modified according to the system feedback signal time.

The drive will follow the operating procedure programmed in Pr7-08, if the feedback signal is lost for more than the time set in Pr7-07.

If this parameter is set to 0.0, the system would not detect any abnormal signal.

Pr7-08	Treatment of the Erroneous PID Feedback Signals			Factory default	0
	Settings	0	warn and keep operating		
		1	warn and RAMP to stop		
		2	warn and COAST to stop		

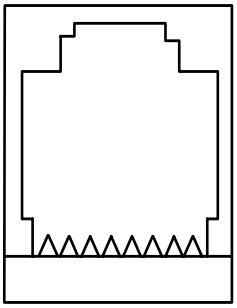
This parameter selects the operation of the drive upon a loss of PID feedback signal.

Pr7-09	Treatment of Keypad Transmission Fault	Factory default	0
	Settings	Warn and RAMP to stop	
		Warn and COAST to stop	
Pr7-10	**Keypad Transmission Fault detection**	Factory default	0.0
	Settings	0.0: Disable and keep operating	
		0.1~60.0 Sec	

Below is RS-485 serial communication port relative parameters

Spedestar PC1 series provide RS-485 serial port
With Modbus networks protocol for serial communication.
The serial port is a standard 8-pin RJ-45 socket as shown.
In case of the traditional twisted pair wire to be used then a RJ-45/TB conjunction board is necessary as an option.
In case another communication network is used, a converter is necessary as an option.
Polyspede offers below converters:
USB to RS-485 Converter
RS-232 to RS-485 Converter
PROFIBUS to RS-232/422/485 Converter
Devicenet to RS-232/422/485 Converter
CANBUS to RS-232/422/485 Converter

RS-485 RS-485 serial port



87654321

RJ-45 socket

Pin assignment
1: Reserved
2: Reserved
3: GND
4: SG-
5: SG+
6: +5V Output
7: Reserved
8: Reserved

Each drive has a pre-assigned communication address specified by Pr7-11. The RS485 master then controls each drive according to its communication address.

Pr7-11	Communication Address		Factory default	1
	Settings	1~254		

When the drive is controlling or monitoring by RS-485 serial communication, the communication address for this drive must be set via this parameter. And the communication address for each drive must be different and unique.

Pr7-12	Transmission Speed (Baud rate)		Factory default	9.6
	Settings	1.2~125 Kbps		

This parameter is used to set the transmission speed between the RS485 master (PLC, PC,etc.) and the drive.

Pr7-13	Transmission Fault Treatment		Factory default	3
	Settings	0	warn and keep operating	
		1	warn and RAMP to stop	
		2	warn and COAST to stop	
		3	No warning and keep operating	

This parameter is set to how to react if transmission errors occur.

Pr7-14	Time-out Detection		Factory default	0.0
	Settings	0.0: disabled		
		0.1~60.0 Sec		

If Pr7-14 is not set to 0.0, Pr7-13=0~2, and there is no communication on the bus during the Time Out detection period (set by Pr7-14), “ASC” will be shown on the keypad.

Pr7-15	Communication Protocol				Factory default	0
	Settings	0	7,N,2 ASCII	1	7,E,1 ASCII	
		2	7,O,1 ASCII	3	7,E,2 ASCII	
		4	7,O,2 ASCII	5	8,N,1 ASCII	
		6	8, N,2 ASCII	7	8,E,1 ASCII	
		8	8,O,1 ASCII	9	8,E,2 ASCII	
		10	8,O,2 ASCII	11	8,N,1 RTU	
		12	8,N,2 RTU	13	8,E,1 RTU	
		14	8,O,1 RTU	15	8,E,2 RTU	
		16	8,O,2 RTU			

Control by PC or PLC

The drive can be set up to communicate on Modbus networks using one of the following modes: ASCII (American Standard Code for Information Interchange) or RTU (Remote Terminal Unit). Users can select the desired mode along with the serial port communication protocol in Pr7-15.

1.Code Description:

ASCII mode:

Each 8-bit data is the combination of two ASCII characters.

For example, a 1-byte data: 64 Hex, shown as '64' in ASCII, consists of '6' (36Hex) and '4' (34Hex).

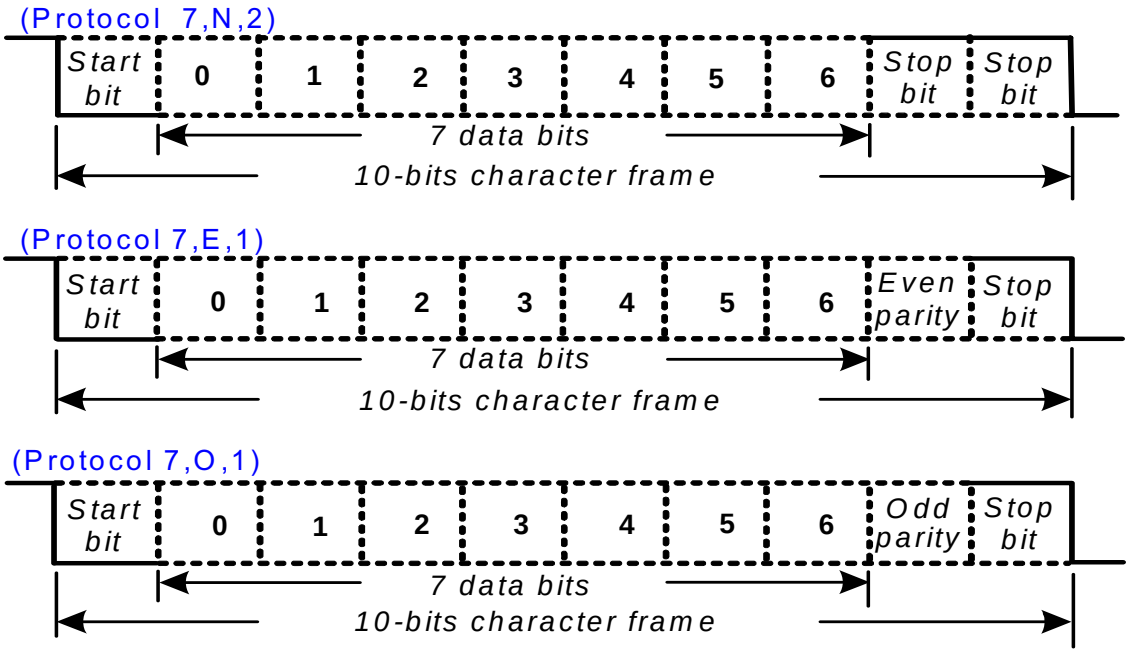
Character	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'	'8'	'9'	'A'	'B'	'C'	'D'	'E'	'F'
ASCII code	30H	31H	32H	33H	34H	35H	36H	37H	38H	39H	41H	42H	43H	44H	45H	46H

RTU mode:

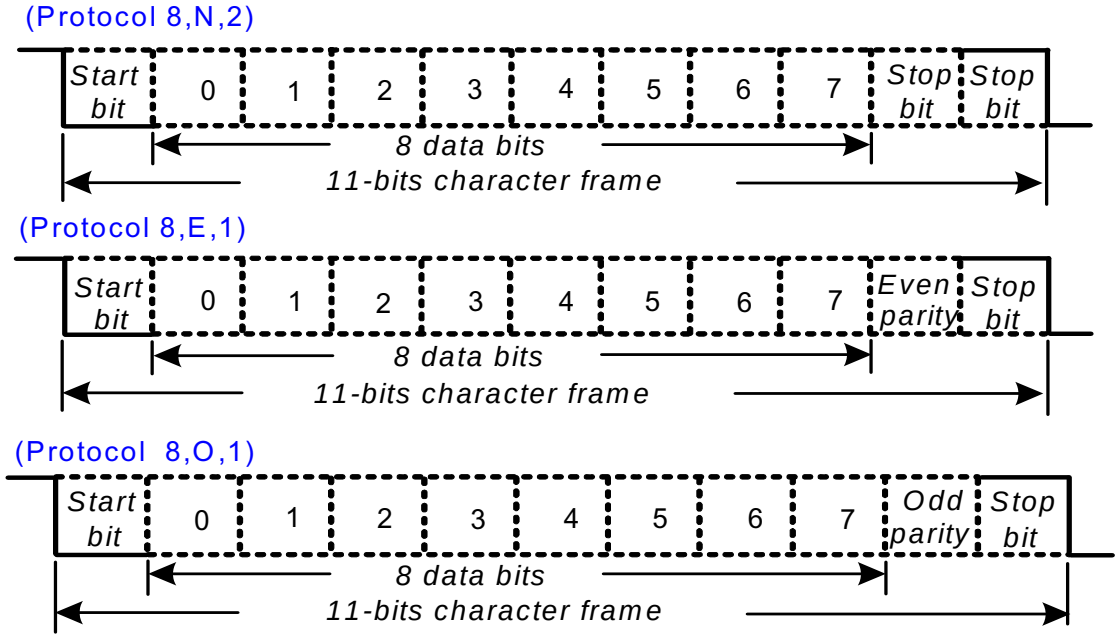
Each 8-bit data is the combination of two 4-bit hexadecimal characters. For example, 64 Hex.

2. Data Format

10-bit character frame (For ASCII):



11-bit character frame (For RTU)



3. Communication Data Structure

3-1 Communication Data Frame

ASCII Mode:

STX	Start character = ':' (3AH)
Address Hi	Communication Address: 8-bit address consists of 2 ASCII codes
Address Lo	
Function Hi	Command code: 8-bit command consists of 2 ASCII codes
Function Lo	
DATA (n-1) to DATA 0	Contents of data: Nx8-bit data consist of 2n ASCII codes n<=16, maximum of 32 ASCII codes
LRC CHK Hi	LRC Check Sum: 8-bit check sum consists of 2 ASCII codes
LRC CHK Lo	
END Hi	End characters: END1= CR (0DH), END0= LF(0AH)
END Lo	

RTU Mode:

START	A silent interval of more than 10 ms
Address	Communication address: 8-bit address
Function	Command code: 8-bit command
DATA (n-1) to DATA 0	Contents of data: n×8-bit data, n<=16
CRC CHK Low	CRC check sum: 16-bit check sum consists of 2 8-bit characters
CRC CHK High	
END	A silent interval of more than 10 ms

3-2 Communication Address

Valid communication addresses are in the range of 0 to 254

00H: Broadcast to all drives (The drive will not reply any message to the master device.)

FFH: Broadcast to all drives (The drive will reply to the master device.)

01H: Drive of address 01

0FH: Drive of address 15

10H: Drive of address 16 ……FEH: Drive of address 254

For example, communication to drive with address 16 decimal (10H):

ASCII mode: Address='1','0' => '1'=31H, '0'=30H

RTU mode: Address=10H

3-3 Function Code and Data characters

The format of data characters depends on the function code.

03H: read data from register (Maximum 16)

06H: write single register

10H: write multiple registers (Maximum 16)

3-3-1 Function Code 03H: Multi read, read data from registers.

Example: reading continuous 2 data from register address 4110 (100EH), Drive address is 01H.

ASCII Mode:

Inquiry message:

STX	':'
Address	'0'
	'1'
Function	'0'
	'3'
Starting address	'1'
	'0'
	'0'
	'E'
Number of data (count by word)	'0'
	'0'
	'0'
	'2'
LRC Check	'D'
	'C'
END	CR
	LF

Response message:

STX	':'
Address	'0'
	'1'
Function	'0'
	'3'
Number of data count by byte	'0'
	'4'
Content of starting Address 4110	'1'
	'7'
	'7'
	'0'
Content of address 4111	'0'
	'0'
	'1'
	'2'
LRC Check	'5'
	'F'
END	CR
	LF

RTU Mode:

Inquiry message:

Address	01H
Function	03H
Starting data address	10H
	0EH
Number of data (count by word)	00H
	02H
CRC CHK Low	A1H
CRC CHK High	08H

Response message:

Address	01H
Function	03H
Number of data (count by byte)	04H
Content of data	17H
	70H
Content of data	00H
	12H
CRC CHK Low	7EH
CRC CHK High	51H

3-3-2 Function Code 06H: write single data to register

Example: writing data 6000(1770H) to parameter Pr1-00, 0100H. drive address is 01H.

ASCII Mode:

Inquiry message:

STX	':'
Address	'0'
	'1'
Function	'0'
	'6'
Data address	'0'
	'0'
	'6'
	'4'
Data content	'1'
	'7'
	'7'
	'0'
LRC Check	'0'
	'E'
END	CR
	LF

Response message:

STX	':'
Address	'0'
	'1'
Function	'0'
	'6'
Data address	'0'
	'0'
	'6'
	'4'
Data content	'1'
	'7'
	'7'
	'0'
LRC Check	'0'
	'E'
END	CR
	LF

RTU Mode:

Inquiry message:

Address	01H
Function	06H
Data address	00H
	64H
Data content	17H
	70H
CRC CHK Low	C6H
CRC CHK High	01H

Response message:

Address	01H
Function	06H
Data address	00H
	64H
Data content	17H
	70H
CRC CHK Low	C6H
CRC CHK High	01H

3-4 The LRC Check of the ASCII Mode

The LRC Check is the added sum from "Address" to "Data Contents". For example, in 3.3.1, the LRC Check for the inquiry message will be: 01H + 03H + 10H + 0EH + 00H + 02H = 24H, then take the complementary of 2, DCH

3-5 The CRC Check of the RTU Mode

The CRC Check starts from "Address" and ends in "Data Contents". Its calculation is as follows:

Step 1: Load the 16-bit register (the CRC register) with FFFFH.

Step 2: Exclusive OR the first 8-bit byte message command with the 16-bit CRC register of the lower bit, then save the result into the CRC register.

Step 3: Shift the CRC register one bit to the right and fill in 0 to the higher bit.

Step 4: Check the value that shifts to the right. If it is 0, save the new value from Step 3 into the CRC register, otherwise, Exclusive OR A001H and the CRC register, then save the result into the CRC register.

Step 5: Repeat Steps 3 and 4 and calculates the 8-bit.

Step 6: Repeat Steps 2~5 for the next 8-bit message command, till all the message commands are processed. And finally, the obtained CRC register value is the CRC Check value. What should be noted is that the CRC Check must be placed interchangeably in the Check Sum of the message command.

Below is the calculation example of the CRC Check using the C language:

```
unsigned char* data <- // index of the message command
unsigned char length <- // length of the message command
unsigned int crc_chk(unsigned char* data, unsigned char length)
{
int j;
unsigned int reg_crc=0Xffff;
while(length--){
reg_crc ^= *data++;
for(j=0;j<8;j++){
if(reg_crc & 0x01){ /* LSB(b0)=1 */
reg_crc=(reg_crc>>1) ^ 0Xa001;
}else{
reg_crc=reg_crc >>1;
    }
  }
}
return reg_crc; // the value that sent back to the CRC register finally
}
```

4 Address list

When placing a command to drive or read data from drive, a complete parameter address in Hexadecimal is necessary.

4-1 How to assign a complete address for every parameter

Parameter address calculation: Address = 100 x G + F

G means parameter group (Group no:0 ~ 9) , F means parameter number, (parameter no. 0 ~ 99)

For example the address of Pr5-20 :

In Decimal = 100 x 5 + 20 = 520 In Hexadecimal = 208H

Refer to chapter 6 for the function of each parameter.

When reading a parameter by function code 03H, only one parameter can be read at one time

Parameter(Prx-xx)	In Decimal	In Hexadecimal
0-00	0 x 100 + 0 = 0	0000
0-14	0 x 100 +14 = 14	000E
1-00	1 x 100 + 0 =100	0064
2-02	2 x 100 + 2 =202	00CA
3-06	3 x 100 + 6 =306	0032
4-00	4 x 100 + 0 =400	0190
5-20	5 x 100 +20 =520	0208
6-10	6 x 100 +10 =610	0262
9-00	9 x 100 + 0 =900	0384
	Infer from this	Infer from this

4-2 Frequently used write in and Read data command in RS-485

The contents of available addresses are shown as below:

To place a write command Function code: 06			
Parameter Address		Command In Hex.	Command Function Description
In Dec.	InHex.		
4000	0FA0	1770	Write in frequency of 60.00 Hz
4001	0FA1	0001	Execute STOP command (Effect when PU light is dark only)
		0201	Execute STOP command
		0002	Execute RUN command (Effect when PU light is dark only)
		0202	Execute RUN command
		0010	Execute REV command (Effect when PU light is dark only)
		0210	Execute REV command
		0020	Execute FWD command (Effect when PU light is dark only)
		0220	Execute FWD command
		0030	Execute FWD/REV command (Effect when PU light is dark only)
		0230	Execute FWD/REV command
		0300	Execute Local/Remote command
4002	0FA2	0001	Execute in EF command
		0002	Execute in RESET command

To read data from drive (To monitoring drive status) Function code: 03			
Parameter Address		Read 1 register	Command Function Description
In Dec.	InHex.	In Hexadecimal	
4109	100D	0001	Bit 0: run command
			Bit 1: run state
			Bit 2: rev command
			Bit 4: rev state
			Bit 5: jog command
			Bit 8: external freq. command
			Bit 9: run/stop F/R pu control
			Bit 10: Run/Stop F/R 485
			Bit 12 :freq command 485
			Bit 15: password
4106	100A	0001	To read U page contents
4108	100C	0001	To read Fault Record (refer to 4-3)
4110	100E	0001	To read content of F page
4112	1010	0001	To read content of H page
4114	1012	0001	To read content of A page
4118	1016	0001	To read DC-BUS voltage (Vdc)
4120	1018	0001	To read Output voltage (Vac)
4122	101A	0001	To read Output Voltage command (Vac)
4130	1022	0001	To read Remaining number of times for the “restart after fault” feature (Pr6-10)
4158	103E	0001	To read Accumulated power-up Day (day)
4160	1040	0001	To read Accumulated power-up time (hh:mm)
4168	1048	0001	To read the signal of AVI analog input (Vdc)

4170	104A	0001	To read the signal of ACI analog input (mAdc)
4172	104C	0001	To read the signal of AUI analog input (Vdc)
4222	107E	0001	To read output power (kW)
4224	1080	0001	To read output power (kVA)
4228	1084	0001	To read The temperature of IGBT--OH1 (°C)
4230	1086	0001	To read The temperature of heat sink--OH2 (°C)
4236	108C	0001	To read Overload accumulated time (OL)
4244	1094	0001	To read DC Bus voltage upon a fault (Vdc)
4246	1096	0001	To read Output voltage upon a fault (Vac)
4248	1098	0001	To read Output frequency upon a fault (Hz)
4250	109A	0001	To read OH1 value upon a fault (°C)
4252	109C	0001	To read Output current value upon a fault (Aac)
4254	109E	0001	To read OH2 value upon a fault (°C)
4290	1090	0001	To read DC Bus ripple voltage (Vdc)
4292	10C4	0001	To read PG frequency (Hz)
4324	10E4	0001	To read Iu (0~1023=5v) (AN0)
4326	10E6	0001	To read Iw (0~1023=5v) (AN1)
4328	10E8	0001	To read VDC (AN2)
4330	10EA	0001	To read TH1 (AN3)
4332	10E	0001	To read Th2 (AN4)
4334	10EE	0001	To read AVI (AN5)
4336	10F0	0001	To read ACI (AN6)
4338	10F2	0001	To read AUI (AN7)
4340	10F4	0001	To read status of PORT0(H/L)
4342	10F6	0001	To read status of PORT1(H/L)
4344	10F8	0001	To read status of PORT3
4346	10FA	0001	To read status of PORT4
4348	10FC	0001	To read status of PORT5
4350	10FE	0001	To read status of PORT20

4-3 The contents of fault record

Code	contents	Code	contents
0	no fault	20	ACI. (ACI error)
1	oC (over-current)	21	ASC (RS-485 error)
2	oU (over-voltage)	22	PI.d (PID error)
3	GF (ground fault)	23	Pu(Keypad communication overtime)
4	SC (IGBT failure)	24	tunE (Auto tuning failure)
5	oL (drive overload)	25	bF (braking chopper failure)
6	oL1 (electronic thermal relay 1)	26	PG (PG error)
7	ot1 (Over-Torque1)	27	PHL (Phase loss)
8	oCn(over-current during constant speed)	28	CC (current signal error during stop
9	oCA (over-current during accel)	29	CPu (CPU error)
10	oCd (over-current during decel)	30	FAn (Fan failure)
11	EP1 (EPROM error 1)	31	AnI fault (Analog input error)
12	EP2 (EPROM error 2)	32	ot2 (Over-Torque2) ♦
13	EF (external fault)	33	oL2 (electronic thermal relay 2) ♦
14	Ct1 (current sensor 1)	34	rnot (Motor selection error) ♦
15	Ct2 (current sensor 2)	36	LUr (Low Voltage during Run)
16	HPF (protection circuit fault)	37	oUd (over-voltage during decel)
17	oH1 (IGBT overheat)	38	x CoPY (Parameter copy error) ♦
18	oH2 (Heatsink overheat)	39	LU (Low Voltage)

19	SoFt (Pre-charge circuit error)	40	bb (External Base Block)

5. Exception response:

The drive is expected to return a normal response after receiving command messages from the master device. The following depicts the conditions when no normal response is replied to the master device.

The drive does not receive the messages due to a communication error; thus, the drive has no response. The master device will eventually process a timeout condition.

The drive receives the messages without a communication error, but cannot handle them.

An exception response will be returned to the master device and an error message “ASCxx” will be displayed on the keypad drive. The xx of “ASCxx” is a decimal code equal to the exception code that is described below.

In the exception response, the most significant bit of the original command code is set to 1, and an exception code which explains the condition that caused the exception is returned.

Example of an exception response of command code 06H and exception code 02H:

ASCII Mode:

STX	‘:’
Address	‘0’
	‘1’
Function	‘8’
	‘6’
Exception code	‘0’
	‘2’
LRC CHK	‘7’
	‘7’
END	CR
	LF

RTU Mode:

Address	01H
Function	86H
Exception code	02H
CRC CHK Low	C3H
CRC CHK High	A1H

: The explanation of exception codes:

exception codes	Explanations
01	Illegal data value: The data value received in the command message is not available for the drive.
02	Illegal data address: The data address received in the command message is not available for the drive.
03	Password Locked: parameter change disabled
04	Parameter change disabled during operation
05	EEPROM Error when the parameter is written in
06	Data Length Error
07	The parameter is a fixed value, for read only
08	When LU, parameter read enabled and parameter change disabled
09	Parameter Locked: parameter read disabled (Pr0-05 bit 0 =1)
10	Communication time-out:: If Pr7-14 is not equal to 0.0, Pr7-13 =0~2, and there is no communication on the bus during the Time Out detection period (set by Pr7-14) “ASC10” will be shown on the keypad.
11	Frame Error: word frame error.
12	Frame Error: parity error

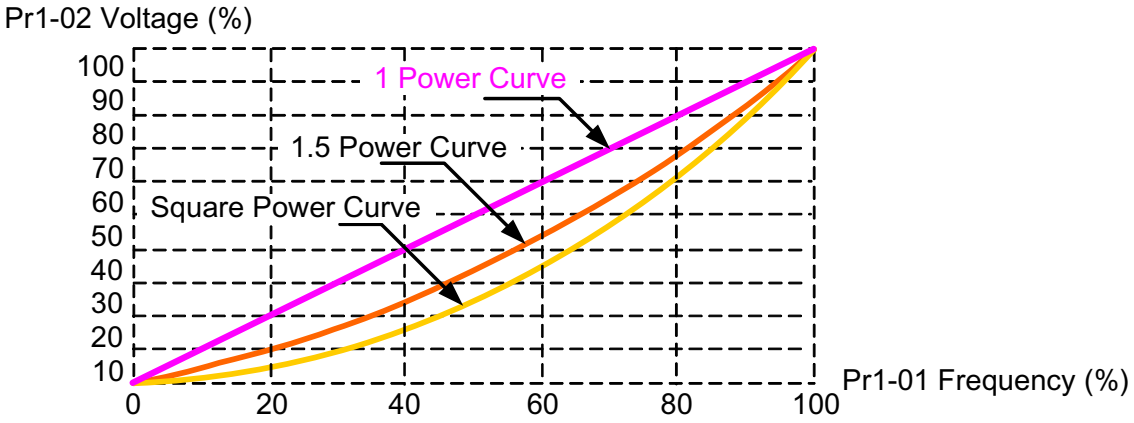
Group 8: Fan & Pump Control Parameters

Pr8-00	V/F Curve Selection	☒	Factory default	0
	Settings	0	V/F Curve determined by Parameter Group 1	
		1	1.5 Power Curve	
		2	Square Power Curve	

When it is set to 0, the V/f curve setting is for setting 1 according to Pr1-01~Pr1-07 and Pr1-36~Pr1-42 are for setting 2.

When this parameter is set to square V/F curve and low frequency torque is lower, it is not suitable for drive to accel/decel quickly. If it needs to accel/decel quickly, it is recommended to set this parameter to '0'.

Please confirm the load curve and select the proper V/f curve before use.



Pr8-01	Start-Up Frequency of the Auxiliary Motor			
	Settings	0.00~600.00 Hz	Factory default	0.00
Pr8-02	**Stop Frequency of the Auxiliary Motor**			
	Settings	0.00~600.00 Hz	Factory default	5.00
Pr8-03	**Time Delay before Starting the Auxiliary Motor**			
	Settings	0.0~6000.0 Sec	Factory default	0.00
Pr8-04	**Time Delay before Stopping the Auxiliary Motor**			
	Settings	0.0~6000.0 Sec	Factory default	0.00

The Start-up Frequency is the initial frequency output upon a RUN command for the auxiliary motor. If the startup frequency setting is 0.00, the auxiliary motor will not be activated.

The Multi-function Output terminals (Pr2-20 ~ Pr2-23) set to 27, 28 or 29 may decide the number of auxiliary motors. The maximum is three. These parameters are good for fan & pump control applications, runs with multiple motors in circulation and parallel control.
The time delays before Starting and before Stopping can prevent motor overheating due to frequent starting and stopping.

The order of stopping auxiliary motors is the first startup, the first stop.
For example:

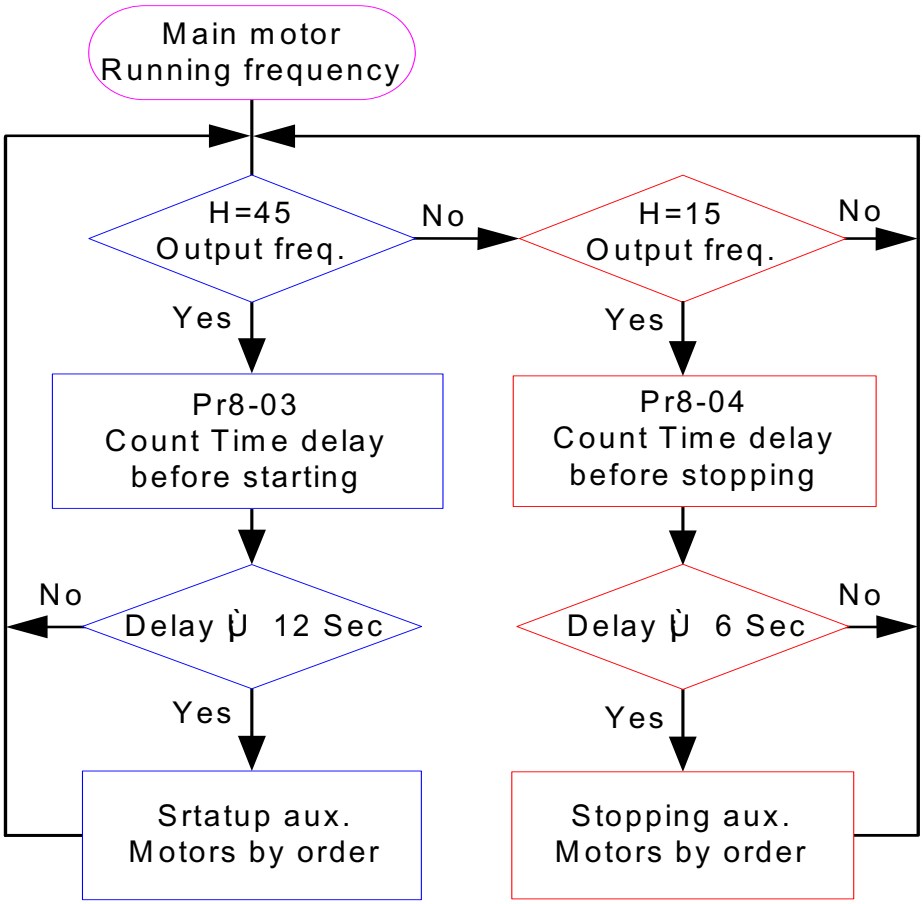
Starting order: auxiliary motor1→auxiliary motor2→auxiliary motor3

Stopping order: auxiliary motor1→auxiliary motor2→auxiliary motor3

Startup procedure example:

Pr8-01 Startup Frequency = 45 Hz Pr8-02 Stopping Frequency =15 Hz

Pr8-03 Time Delay before Starting =12 Sec Pr8-04 Time Delay before Stopping =6 Sec

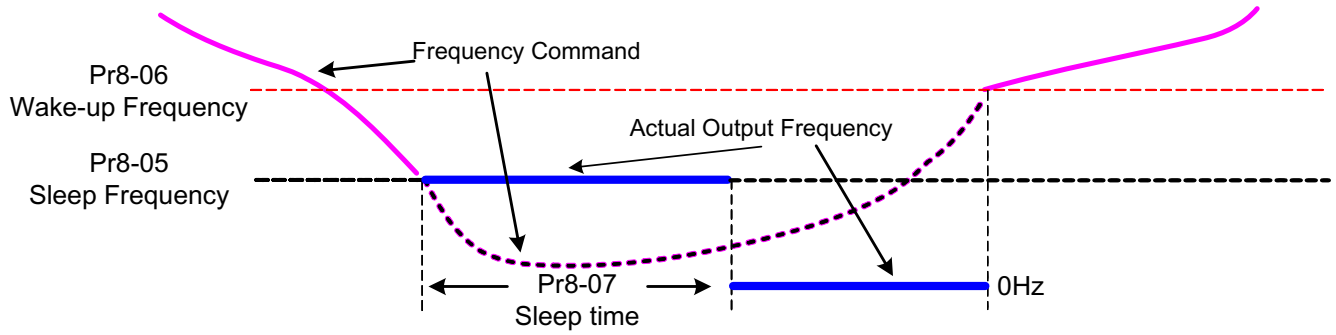


Pr8-05	**Sleep Frequency**			
	Settings	0.00~600.00 Hz	Factory default	0.00
Pr8-06	**Wake-up Frequency**			
	Settings	0.00~600.00 Hz	Factory default	0.00
Pr8-07	**Sleep Time**			
	Settings	0.0~6000.0 Sec	Factory default	0.0

These parameters determine sleep functions of the drive. If the command frequency falls below the sleep frequency, for the specified time in Pr8-07, then the drive will shut off the output and wait until the command frequency rises above Pr8-06 wake-up frequency.

When the drive is in sleep mode, frequency command is still calculated by PID.

When frequency reaches wake up frequency, the drive will accelerate from Pr1-08 start-up frequency by V/f curve. The wake up frequency must be higher than sleep frequency.



Sleep Function

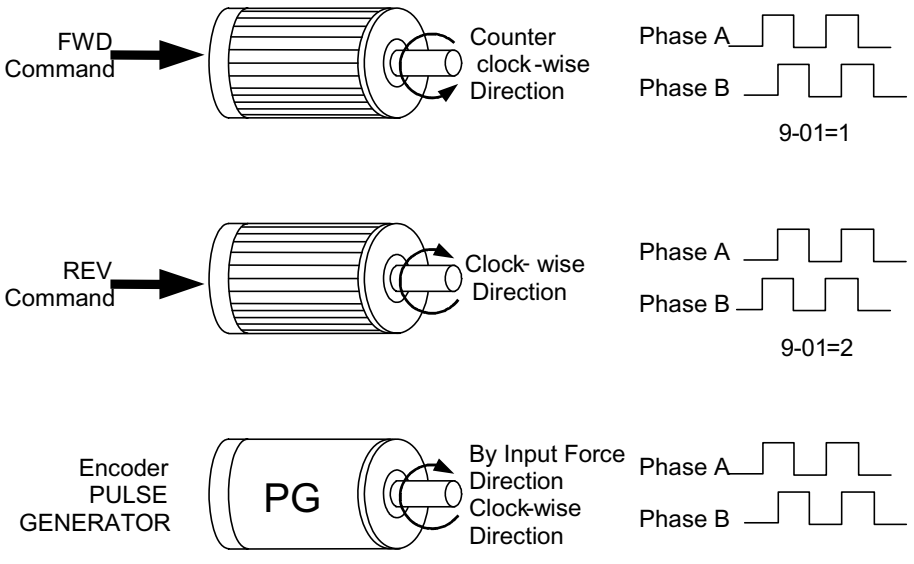
Group 9: Speed Feedback Control Parameters

(A PG Feedback Card (optional) is necessary for setting these parameters)

Pr9-00	PG Pulses	☒	Factory default	1024
	Settings	1~5000 PPR		

This parameter sets the PG (Pulse Generator also called encoder) pulse per revolution.

Pr9-01	PG Type and Function setting		☒	Factory default	0
	Settings	0	Disable PG		
		1	Bi-direction, Phase A leads in a forward run command and phase B leads in a reverse run command		
		2	Bi-direction, Phase B leads in a forward run command and phase A leads in a reverse run command		
		♦4	As PID feedback (REV)		
		♦5	As PID feedback (FWD)		
		♦8	Frequency command (REV) (Pr0-18=4)		
		♦9	Frequency command (FWD) (Pr0-18=4)		



Motor Rotation Direction and the Definition of PG output

Pr9-02	PG Speed Feedback Display Filter	☒	Factory default	0.03
	Settings	0.000~1.000sec		

When Pr0-07 is set to 88, its display will be updated regularly. This update time is set by Pr9-02.

Pr9-03	PG feedback speed control Proportional Gain (P)	Factory default	20.0
	Settings	0.0~500.0%	

This parameter determines the proportional control and associated gain (P), and is used for speed control with PG feedback. If the gain is large, the response will be strong and immediate (If the gain is too large, vibration may occur). If the gain is small, the response will be weak and slow.

Pr9-04	PG feedback speed control Integral Time (I)	Factory default	0.50
	Settings	0.00~10.00 Sec	
		0.00 : no integral	

This parameter determines integral control and associated gain (I), and is used for speed control with PG feedback. If the integral time is long, the response will be slow. If the integral time is short, the response will be quick. Be careful not to set (I) too small, since a rapid response may cause oscillation in the PID loop.

If the integral time is set as 0.00, Pr9-04 will be disabled.

Pr9-05	PG feedback speed control Differential (D) Time	Factory default	0.00
	Settings	0.00~5.00 Sec	

This parameter determines the damping effect for the PG feedback loop. If the differential time is long, any oscillation will quickly subside. If the differential time is short, the oscillation will subside slowly.

Pr9-06	PG Speed Control Output Frequency Limit	Factory default	20.00
	Settings	0.00~150.00Hz	

This parameter limits the amount of correction by the PI control on the output frequency. When control speed via PG feedback. It can limit the maximum output frequency.

Pr9-07	Treatment of PG Feedback Fault		Factory default	0
	Settings	0	warn and keep operating	
		1	warn and RAMP to stop	
		2	warn and COAST to stop	

The treatment when the PG feedback signals are abnormal and exceed the time setting in Pr9-08.

Pr9-08	PG Feedback Fault Detection Time	Factory default	0.10
	Settings	0.00~10.00 Sec	

The feedback signal is in error, if it is outside the Slip Range, or if it is over the Stall Level. Once either of the errors is met, the drive will begin to accumulate time. If the feedback signal continues to be in error at the end of the Detection Time period, the drive will display a 'PG' error message.

Pr9-09	PG Feedback compensation limit	Factory default	90	♦
	Settings	0~900 RPM		

This parameter may be used to limit the compensation of PG feedback by filling-in the slip ratio of motor.

CHAPTER 7 ERROR MESSAGE AND TROUBLESHOOTING

The Drive has a comprehensive fault diagnostic system that includes various alarms and fault messages such as over-voltage, low-voltage and over-current. Once a fault is detected, the corresponding protective functions will be activated, and the Drive will stop the output and the motor will then coast to stop. The following faults are displayed as shown on the Drive digital keypad panel. Once a fault has occurred, eliminate it first, and 5 seconds later, press the RESET button to reactivate the operation.

7-1 Problems and Solutions

Fault name	Fault Descriptions	Treatments
	Over Current (oC): The Drive detects an abnormal increase in Output current.	◆ Check whether the motor's horsepower corresponds to the Drive output power. ◆ Check the wiring connections between the Drive and motor for possible short circuits. ◆ Increase the Acceleration time (Pr1-11, Pr1-12) ◆ Check for possible excessive loading conditions at the motor. ◆ If there are any abnormal conditions when operating the Drive after short-circuit being removed, it should be sent back to manufacturer.
	Over Voltage (oU): The Drive detects that the DC bus voltage has exceeded its maximum allowable value. 230 V class: about 400V	◆ Check whether the input voltage falls within the rated Drive input voltage. ◆ Check for possible voltage transients. ◆ Bus over-voltage may also be caused by motor regeneration. Either increase the decel. time or add an optional braking unit and braking resistor.
	Over Voltage (oUd): The Drive detects that the DC bus voltage has exceeded its maximum allowable value while in deceleration. 230 V class: about 400V	◆ DC bus over-voltage caused by motor regeneration. ◆ Either increase the decel. time or add an optional braking resistor. ◆ Some models need to add a Dynamic Brake Unit (optional). ◆ Check whether the required braking power is within the specified limits.

Fault name	Fault Descriptions	Treatments
GF	Ground Fault (GF): The Drive output is abnormal. When the output terminal is grounded (short circuit current is 50% more than the drive rated current), the Drive power module may be damaged. The short circuit protection is provided for Drive protection, not for personnel protection.	◆ Check whether the connection to the motor is short circuited or grounded ◆ Check whether the IGBT power module is functioning right ◆ Check whether the wiring on the output side has poor insulation
SC	Short Circuit (SC): Output side of Drive is short circuited	◆ Check whether the motor's resistance and insulation are functioning right ◆ Check whether the connection to the motor is short circuited
oL	Over Load (oL): The Drive detects excessive drive output current. Note: PC1 series can withstand up to 150 % of the rated current for a maximum of 60 seconds.	◆ Check whether the motor is overloaded ◆ Reduce torque compensation setting as set in Pr5-01 ◆ Increase the acceleration time ◆ Increase the Drive output capacity
oL 1	Over Load 1 (oL1): Motor overload Internal electronic thermal relay 1 protections	◆ Check for possible motor overload ◆ Check electronic thermal overload setting (Pr5-18 to Pr5-19) or Increase motor capacity. ◆ Reduce the current level so that the drive output current does not exceed the value set by the Full-Load Current of Motor1 Pr5-00
ot 1	Motor over torque1 (ot1)	◆ Check whether the motor is too heavly overloaded ◆ Check the setting of the over-torque detection level 1 (Pr5-15 to Pr5-17)

Fault name	Fault Descriptions	Treatments
ot2	Motor over torque2 (ot2)	◆ Check whether the motor 2 is being heavily overloaded ◆ Check the setting of the over-torque detection level 2 (Pr5-21 to Pr5-23)
oCn	Over-current during Steady State Operation (oCn)	◆ Check for possible poor insulation on the output wires ◆ Check for possible motor stall ◆ Replace the Drive with one that has a higher output capacity (next Hp size up)
oCA	Over-current during Acceleration (oCA)	◆ Check for possible poor insulation on the output wires ◆ Decrease the torque boost setting in Pr5-01 ◆ Increase the acceleration time ◆ Replace the Drive with one that has a higher output capacity (next Hp size up)
oCd	Over-current during Deceleration (oCd)	◆ Check for possible poor insulation on the output wires ◆ Increase the deceleration time ◆ Replace the Drive with one that has a higher output capacity (next Hp size up)
EP2	Internal memory IC cannot be programmed (EP2)	◆ Switch off the power supply, then re-power on. ◆ Check whether the input voltage falls within the rated Drive input voltage. ◆ Return to the factory
EP 1	Internal memory IC cannot be read (EPC1)	◆ Check the connections between the main control board and the power board. ◆ Reset drive to factory defaults. ◆ Return to the factory if the previous methods do not re-solve the issue.
EF	The external terminal EF-GND goes from OFF to ON (EF)	◆ When external terminal EF-GND is closed, the output will be turned off (under N.O. E.F.). ◆ Eliminate the fault source and then press the RESET button
Ct 1	The internal A/D 1 loop is defected (Ct1)	◆ Return to the factory
Ct2	The internal A/D 2 loop is defected (Ct2)	◆ Return to the factory
HPF	Hardware Protection Failure (HPF)	◆ Check every appliance that connects to the Drive ◆ Return to the factory

Fault name	Fault Descriptions	Treatments
oH 1	The Drive temperature sensor detects excessive heat on IGBT module (oH1)	◆ Check the cooling fan ◆ Ensure that the ambient temperature falls within the specified temperature range. ◆ Make sure that the ventilation path is not obstructed. ◆ Remove any foreign objects on the heat sinks and check for possible dirty heat sink fins. ◆ Provide enough spacing for adequate ventilation.
oH2	The Drive temperature sensor detects excessive heat on Heat-sink (oH2)	
SoFt	Inrush limit resistor fault (SoFt)	◆ Return to the factory
AC I.	ACI loose wires (ACI.)	◆ Check the wiring of ACI
ASC	Communication Error (ASC)	◆ Check the connection between the drive and master for loose wires
P I.d	PID function error (PI.d)	◆ Check whether the PID parameters setting is appropriate ◆ Check the PID feedback wiring
Pu	KEYPAD communication Overtime (Pu)	◆ Check whether the keypad communication circuit is well-connected
tunE	Auto Tuning Error (tunE)	◆ Check cabling between drive and motor. ◆ Check whether the motor horsepower corresponds to the Drive rated output power. ◆ Retry again
bF	Braking Transistor Fault (bF)	◆ Return to the factory
PG	PG loose wires (PG)	◆ Check the PG connection ◆ Check whether the motor is blocked
CC	Current signal error while the drive is stopped (CC)	◆ Return to the factory
CPu	Electronics Circuit Fault (CPu)	◆ Return to the factory
FAn	Cooling Fan Fault (FAn)	◆ Check whether the cooling fan is blocked ◆ Return to the factory

Fault name	Fault Descriptions	Treatments
LU	The Drive detects that the DC bus voltage has fallen below its minimum value (LU)	◆ Check whether the input power voltage is normal ◆ Check for unexpected heavy loading of the motor
LUr	The Drive detects that the DC bus voltage has fallen below its minimum value during run (LUr)	◆ Check for Inrush limit resistor by-pass circuit fault ◆ Check that the input power was not interrupted
bb	External Base Block (bb): Drive output is turned off.	◆ When the external input terminal (B.B) is active, the Drive output will be turned off. ◆ Disable this connection and the Drive will begin to work again.
rnot	Motor selection error (rnot)	◆ Check the motor wiring connections
oL2	Over Load 2 (oL2): Motor overload Internal electronic thermal relay 2 protections	◆ Check for possible motor overload ◆ Check electronic thermal overload setting (Pr5-18 to Pr5-19) or Increase motor capacity. ◆ Reduce the current level so that the drive output current does not exceed the value set by the Full-Load current of Motor 2 (Pr5-40)
1 CoPy	EEPROM of PU-02 failure (1 CoPy)	◆ Replace a PU-02
2 CoPy	Nothing to save due to PU-02 is empty (2 CoPy)	◆ Make sure PU-02 had read data then try again
3 CoPy	Cannot Save due to drive model is not the same (3 CoPy)	◆ Recheck the drive models
4 CoPy	Parameter error in PU-02 (4 CoPy)	◆ Parameter is out of range, recheck the Parameter in PU-02
7 CoPy	Cannot Save due to drive is running (7 CoPy)	◆ Stop the drive then try again
8 CoPy	Cannot Save or Read due to drive was password locked (8 CoPy)	◆ Unlock the drive then try again

7-2 Electromagnetic/Induction Noise

There are many noises that surround motor drives and induce it by radiation or on the power circuit. It may cause the mis-operation of control circuit and even damage the drive. Of course, there is a solution to increase the immunity against noise. But it is not the best one due to the limit. Therefore, solve it from the outside as following will be the best.

1. Add surge killer on the relay or contact to suppress switching surge between ON/OFF.
2. Shorten the wiring length of the control circuit and separate from the main circuit wiring.
3. Comply with the wiring regulation for those shielded wire and use isolation amplifier for long wire.
4. The grounding terminal should comply with the local regulation and ground independently, i.e. not to have common ground with electric welding machine and power equipment.
5. Connect a noise filter at the input terminal of the drive to prevent noise from power circuit. In a word, three-level solutions for electromagnetic noise are “no product”, “no spread” and “no receive”

7-3 Environmental Condition

Since the drive is an electronic device, you should comply with the environmental condition stated in Chapter 2. The following necessary basic remedial measures.

1. To prevent vibration, anti-vibration spacer is the last choice. The vibration tolerance must be within the specification. The vibration effect is equal to the mechanical stress and it cannot occur frequently, continuously or repeatedly to prevent damaging drive.
2. Store in a clean and dry location free from corrosive fumes/dust to prevent rust, poor contact. The solution is to use dust-proof enclosure. Humid locations may cause shorts by condensation. In particular occasions, the enclosure may need to be airtight.
3. The surrounding temperature should be within the specification. Too high or low temperature will affect the lifetime and reliability. For semiconductor components, damage will occur once any specification is out of range. Therefore, it is necessary to clean and periodically check the air filter and cooling fan, regardless of having external cooling. In addition, the microcomputer may not work in extreme low temperatures and may require a in cabinet heater.
4. Store within a relative humidity range of 0% to 90% and non-condensing environment.

7-4 Affecting Other Machines

Drive may affect the operation of other machines due to many reasons. The solutions are as follows.

High Harmonic at Power Side

If there is high harmonic at power side during running, the improved methods are:

1. Separate power system: use transformer for drive.
2. Use AC Reactor at the power input terminal of drive or decrease high harmonic by multiple circuit.
3. If there is a phase lead capacitor, it should use a serial reactor to prevent capacitor damage from high harmonic.

Motor Temperature Rises

When the motor is induction type with Totally Enclosed Fan Cooled (TEFC) used in variable speed operation, inefficient cooling will happen at low speeds. Therefore, it may overheat. Besides, high harmonic content on the output waveform, which can increase copper loss and iron loss. Following measures should be used by load situation and operation range when necessary.

1. Use a motor with independent powered ventilation Totally Enclosed Blower Cooled (TEBC) type or increase the horsepower.
2. Use inverter duty motor.
3. DO NOT run at a low speeds for extended times.

CHAPTER 8 STANDARD SPECIFICATIONS

Series			SPEDESTAR PC1 series High performance general purpose multi-function drive
Control Characteristics	Output frequency range		0.1 - 600Hz, Programmable
	Overload endurance		150% of rated current for 1 minute/10 minutes, Ta <=40, 200% of rated current for 2 seconds
	Maximum output voltage		Proportional to Input Voltage, 3-Phase output
	Power factor/Efficiency		Power factor no lower than 0.95. Efficiency no lower than 95% at full load
	Control system		SPWM (Sinusoidal Pulse Width Modulation) vector control, 4 control modes :V/F, V/F + PG, SVC & VC + PG
	Speed control range		V/F mode 20:1; V/F+PG mode 120:1; SVC mode 120:1; VC+PG mode 600:1
	Output frequency resolution		Analog input: 10Bit(1/1024), Digital input: 0.01Hz, Fly-Shuttle dial input: 0.01Hz
	Output frequency accuracy		Analog input: Within ±0.2% of max. output frequency (25℃ ±10℃). Digital input: Within 0.01% of set output frequency
	PWM carrier Frequency		0.7 -18kHz, Adjustable (Some models are limited)
	Torque characteristics		auto-torque boost, auto-slip compensation; starting torque can be 150% at 1.0Hz
	Skip frequency		Setting range 0.00 -600Hz, Max. 6 points, skip width are adjustable
	Accel/Decel time		0.1-60000 seconds (2 Independent settings for Accel/Decel Time)
	Stall prevention		0 to 250% of Rated Current, independent adjustable both in acceleration and constant speed operation.
	DC Braking		DC Braking available at start and stop, Braking Current Level: 0 to 125% of rated output current. Braking time: 0 to 60 seconds. Braking Start-Point when stopping: 0.1-600Hz
	Dynamic braking		Braking torque Approx. 20%(10%E.D.). Dynamic Brake chopper built-in in Frame code: xx-B. All models can connect to an external Dynamic Brake Unit (HBU-xxxx series).
	V/F Pattern		2 adjustable Random V/F curve. Constant Torque curve & Reduced Torque curve are available.
OPERATING Characteristics	Frequency Setting	Keypad	By an Encoder style Fly-Shuttle dial. (Setting resolution 0.01Hz/0.1Hz/1Hz/10Hz adjustable)
		External Signal	0 ~ +10VDC((Input impedance 20kΩ), -10 ~ +10VDC((Input impedance 10kΩ), 4 ~20mA DC ((Input impedance 250Ω),Multi-Function Inputs 1 ~ 6 (15 Steps Jog, up/down), PLC run, RS-485 port MODBUS protocol
	Operation Setting	Keypad	Set by RUN, STOP and JOG. Switch-able between Keypad and External signal
		External Signal	2 wire control (FWD/STOP-REV/STOP-RUN/STOP-FWD/REV), 3 wire control, FWD, REV, MI1 to MI6 can be combined to offer various modes of operation, RS-485 serial interface MODBUS protocol
	Multi-Function Digital Input (DI) (6 terminals)		Multi-step selection 0 to 15, first to second accel/decel switches, accel/decel inhibit, Input the counter, Pause Stop, EF Input, Emergency Stop, auxiliary motor control is invalid, ACI/AVI/AUI speed command selection, Reset, PLC Run, Jog, Up/Down command, Sink/Source selection, Parameter team selection…etc, up to 43 functions.
	Multi-Function Output Indication (DO) (4 indications)		Include a form C relay contact, a form A relay contact and 2 Open collector output. They can be programmed to below indications: Drive Operating, Frequency Attained, zero speed, Base Block, Over torque, Fault Indication, Local/Remote indication, PLC Operation indication, and Auxiliary Motor Output, Drive ready for use, IGBT over-heat indication …etc, up to 63 functions.
	Multi-Function Analog Input (AI)		AVI: 0 ~ +10VDC((Input impedance 20kΩ), AUI: -10 ~ +10VDC((Input impedance 10kΩ), ACI: 4 ~20mA DC ((Input impedance 250Ω). 3 different Input terminals can be programmed to 15 functions
	Multi-Function Analog Output (AO)		Include ACO and AVO, They can be programmed Proportional to output frequency, output current, voltage, frequency command or motor's speed …etc, up to 15 functions.
	Fault Indication		The output will be activated when faults occur (User may get 1 or up to 4 indications from below terminals: 2 Relay contact point RA, RB, RC. or 2 Open-collector
	Communication function		RS-485 serial port, MODBUS protocol, ASCII & RTU. (Baud rate up to 125 k bps)
Other Functions			PID feedback control, Flying start, Automatic voltage regulation (AVR), 2 accel./decel time selection , Auto-optimum accel./decel. Time, S-curves, External fault interlock, External fault reset, Auto Restart after fault, 16 Fault records, Automatic energy–saving, Upper/Lower limit, Programmable pulse output, Password protection, Pump and Fan process control, Sleep/Wakeup function , Auto-Tuning, By-Pass, Y-Delta control,. Bi-Directional Speed search, Reverse inhibit, Automatic torque boost & slip compensation, 16-step PLC run, 16 step preset speed, Coast or ramp to stop, Random V/F curve, Mechanical brake release control, IGBT/ Heatsink temperature display & Pre-warning, Quiet operation mode (No noise), User define Multi-function display, Over torque detection, Over current/voltage stall prevention, Sink/Source (NPN/PNP) mode, Electronic Thermal Relay, Internal Counter, DC injection brake both in start and stop, Dynamic brake, Controlled cooling Fan, Removable keypad operator, Programmable Multi-Function DI,DO,AI,AO and Ry terminals.
Intelligent Protection Functions			Self-testing, AC source Over Voltage, Over Voltage, Over Current, Under Voltage, Over Torque, External Fault, Motor over-load, IGBT Over-temperature, Heat-sink Over-temperature, Electronic thermal, Ground Fault, Output short circuit, Stall Prevention, Fuse protection, IGBT short circuit , Drive Over Load , DC bus capacitor life monitoring, Auto carrier frequency adjust according temperature, 16 Trip records, Run information of latest Fault such like DC-BUS voltage, Output voltage/Frequency/Current, Command frequency, IGBT temperature, Heat-sink temperature….etc.
Digital Keypad (PU-02 Digital Keypad with copy function and PU-03 Digital Keypad with LCD display are available as an option)			**Eight Function keys:** Access Run, Stop, Reset/ Digit Shift, Forward/ Reverse run, Display mode, Keypad Enable, Programming data and Jog operation…etc. **One Encoder style Fly-Shuttle dial:** Sets the parameter number and changes the numerical data **One 6 digits 7 segment display:** Display the Setting frequency/actual operation frequency, Output current/Voltage, motor speed, Fault trip User defined unit (up to 88 type)…etc. **Six LED Display for status indication:** Display the Drive run/stop status, Forward/Reverse run status, Keypad enable, and Frequency command source. **One RJ-45 connector:** Removable Keypad, remote control distance up to 150 meters.
Environment	Certificate		Complies with CE (EN61800-3) standard
	Temperature		Ambient: -10°C ~ +40°C/(-10°C ~ + 50°C) (Non-Condensing and not frozen). Storage: -20°C ~ +60°C
	Humidity		Below 98% R.H. (Non-Condensing)
	Vibration		Below 20Hz: 1G, above 20Hz: 0.6G
	Installation Location		Altitude 1,000 m or lower, keep away from corrosive gasses, liquid and dust

***SPEDESTAR series are designed and manufactured based on CNS and IEC, IEEE, CE & UL standard.**

SPEDESTAR PC1: 1-Phase, 200~240VAC, 50/60 Hz (Tolerance Range: 180~264V, 47~63Hz)											
Model	Applicable Motor (230V 4 P)		Rated Output				Source	Enclosure Construction			
SPEDESTAR **PC1-xxxxx**	Power (kW)	Horse Power (Hp)	Capacity (kVA)	Current (A)	Voltage (V)	Frequency (Hz)	Current (A)	Cooling Methods	Protection Methods (IP/NEMA)	Net Weight (kg)	Frame Code
50	3.7	5	6.8	17	3-Phase, 0-240 (Max)	0.1-600	36	Fan- cooled	IP 20 NEMA 1	4.0	B
75	5.5	7.5	10	25			54			11.9	C
100	7.5	10	13	33			72			12.3	
150	11.5	15	20	45			99			13.5	
200	15	20	26	60			132		IP 00 NEMA 0 (IP 20 NEMA 1 IP 21 NEMA 1 optional)	32.7	D
250	18.5	25	30	73			160			33.8	
300	22	30	36	91			200			34.6	

CHAPTER 9 DYNAMIC BRAKE AND BRAKING RESISTORS

9-1 The Braking function design of Spedestar PC1 series

The Dynamic Braking function is to absorb the motor regeneration energy when the motor stops by deceleration, the regeneration energy will be dissipated in dedicated braking resistors. Dynamic Brake is built-in as standard in all models with Frame code B. Other models can be built-in as an option.

Drive Model	Brake unit			Recommended Braking Resistor Braking Torque =125%, E.D.=10%				Connectable Min. Resistance value of each drive
PC1-xxx	Model: HBU-xxxx	Qty	Diagram (refer to 9-1-1)	Equivalent resistor specification of each drive	Braking Resistor to be use		Wiring (refer to 9-1-2)	
					Specification	Qty		
50	Built-in (can be connected to an external Braking unit)		A*, B	400W 40Ω	400W 40Ω	1	1p	33Ω
75	2015	1	B	600W 30Ω	600W 30Ω	1		30Ω
100	2015	1	B	800W 20Ω	800W 20Ω	1		20Ω
150	2015	1	B	2400W 13.6Ω	2400W 13.6Ω	1		13.6Ω
200	2015	1	B	3000W 10Ω	3000W 10Ω	1		10Ω
250	2015	2	C	4800W 8.0Ω	2400W 16Ω	2		8Ω
300	2015	2	C	4800W 6.8Ω	2400W 13.6Ω	2		6.8Ω

*** :** Only for models which Dynamic Brake is built-in as an option.

9-1-1 Wiring of Dynamic Braking Unit

*1: Refer to 9-1-2 for wiring of Braking

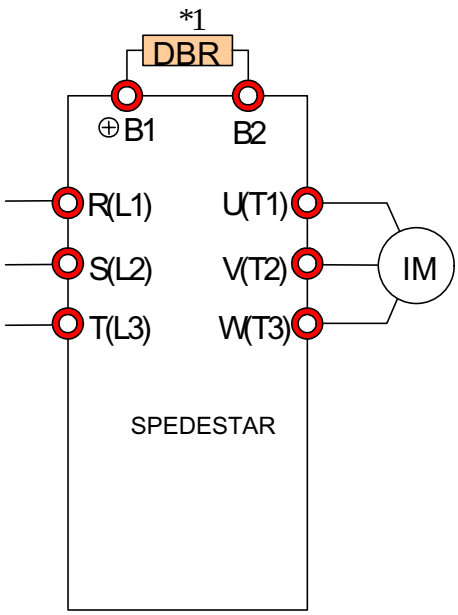


Diagram A

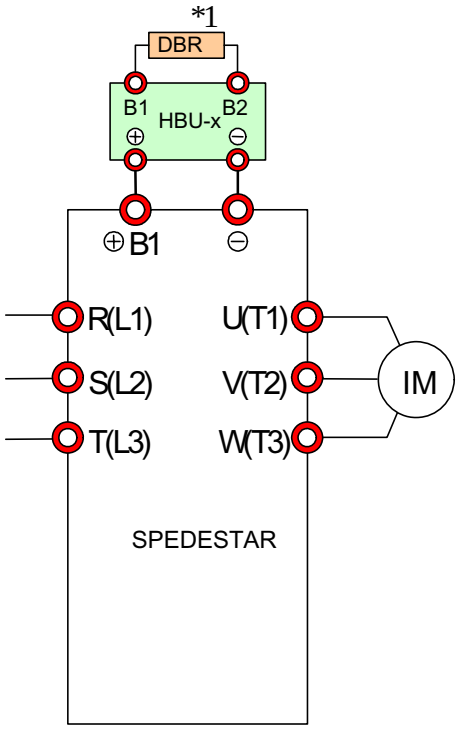


Diagram B

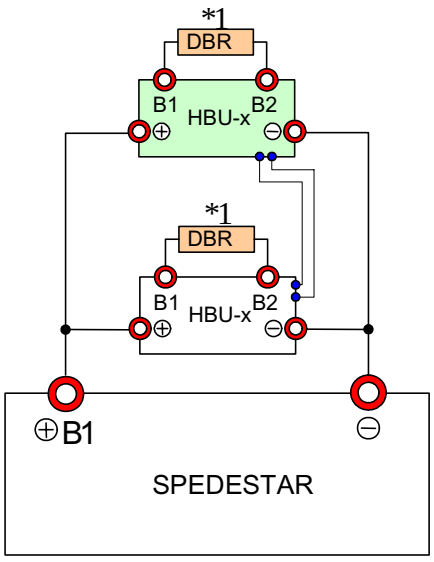


Diagram C

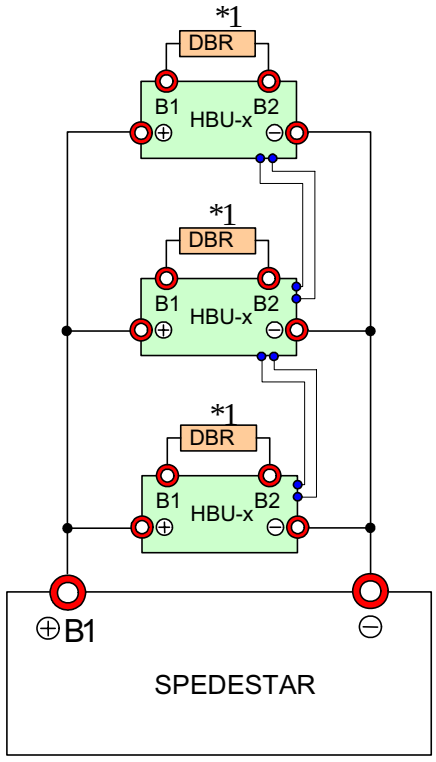
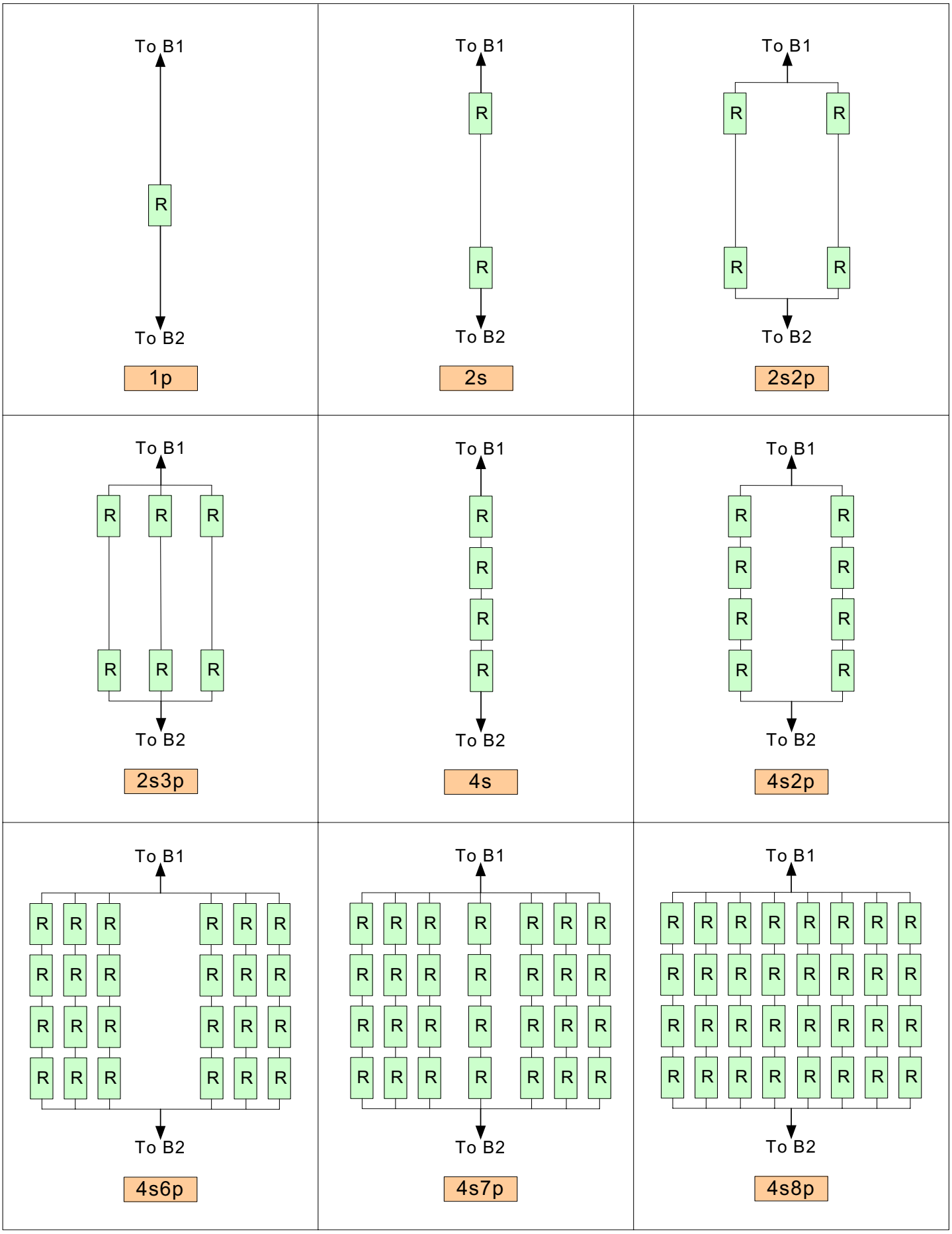


Diagram D

9-1-2 Wiring of Braking resistors

S= in Series connection, P= in Parallel connection



9-2 Dynamic Braking unit (HBU series)

All Spedestar PC1 series can be connected to an external Dynamic Braking unit, in case the braking function is needed.

HBU braking units are suitable for all of Polyspede's Spedestar family AC Motor Drives 230V voltage class. HBU braking units need to be used in conjunction with DBR series braking resistors to provide the optimum braking characteristics.

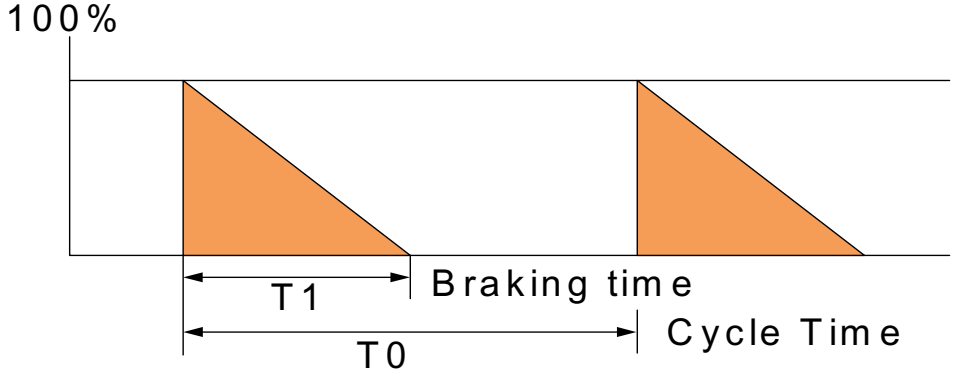
Model HBU-		2015
Suitable for Drive source (ACV)		200 to 240
Power Input Rating (DCV)		200 to 400
Output Rating	Max. Discharge Current (Amp. peak) 10% ED	50
	Continuous Discharge Current (Amp.)	15
	Connectable Minimum resistance for Each Braking Unit	10Ω
	Braking Start-up Voltage (DCV)	380 (± 38V)
Protection	Heat Sink Overheat	Temperature over +95° (203 °F)
	Alarm Output	Relay contact, 5A120VAC/28VDC (RA, RB, RC)
	Power Charge Display	Lit on when DC bus voltage is above ~35VDC
Environment	Installation Location	Indoor (no corrosive gases, metallic dust)
	Operating Temperature	-10 °C ~ +40 °C (14 °F to 104 °F) (no frost)
	Storage Temperature	-20 °C ~ +60 °C (-4 °F to 140 °F)
	Humidity	90% Non-condensing
	Vibration	9.8m/s2 (1G) 10-20Hz, 2m/s2 (0.2G) at 20~50Hz
	Mechanical Configuration	Enclosed type IP20 (NEMA 1)

9-3 Braking Resistor (DBR series)

	Specifications		Ordering information (DBR-xxxxxxxx)	
	Power rating (W)	Resistance (Ω)	Wire-wound type	
1	80	750	DBR-C080W750	Ceramic Encased
2		200	DBR-C080W200	
3	300	400	DBR-C300W400	
4		250	DBR-C300W250	
5		100	DBR-C300W100	
6	400	150	DBR-C400W150	
7		40	DBR-C400W040	
8	500	100	DBR-C500W100	
9		30	DBR-C500W030	
10	1000	75	DBR-C1K0W075	Indoor Enclosure Ventilated
11		50	DBR-C1K0W050	
12		20	DBR-C1K0W020	
13	1200	8	DBR-C1K2W008	
14		6.8	DBR-C1K2W6P8	
15	1500	40	DBR-C1K5W040	
16		5	DBR-C1K5W005	

Note:

1. Please select the factory default resistance value (Watt) and the duty cycle (E.D. %).
The definition of the braking usage ED(%) is for assurance of enough time for the braking unit and braking resistor to dissipate away heat generated by braking. When the braking resistor heats up, the resistance would increase with temperature, and braking torque would decrease accordingly.

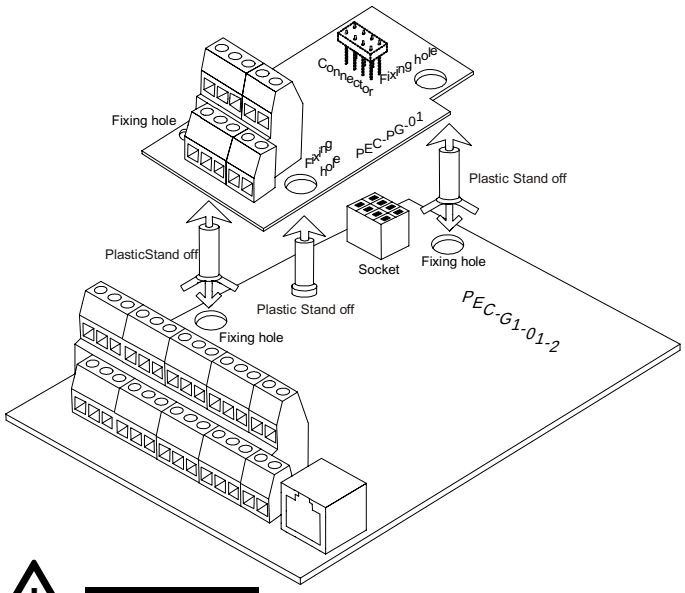


Definition for Braking Usage : ED%=T1/T0x100(%)

2. For an application with large regenerative power such as hoisting, the braking torque or other items may exceed the capacity of a braking unit with a braking resistor in a standard combination (and result in capacity overload). Contact your Polyspede representatives when the braking torque or any other item exceeds the value in the table.
3. If damage resulted to the inverter or other equipment due to the fact that the braking resistors and the braking unit in use are not provided by Polyspede, the warranty will be void.
4. Take into consideration the safety of the environment when installing the braking resistors.
5. If the minimum resistance value is to be utilized, consult local dealers for the calculation of the Watt figures.
5. Please select thermal relay trip contact to prevent resistor over load.
6. When using more than 2 braking units, equivalent resistor value of parallel braking unit cannot be less than the value in the column "**Minimum resistance for each drive"**

CHAPTER 10 SPEED FEEDBACK PG CARD

PEC-PG-01 Installation

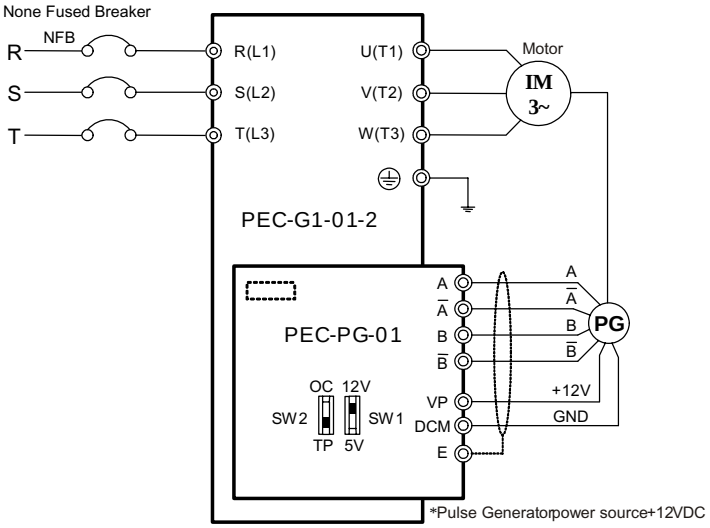


WARNING

Fig.1

Please be sure that the SW1 & SW2 are set to the suitable Pulse Generator connected.

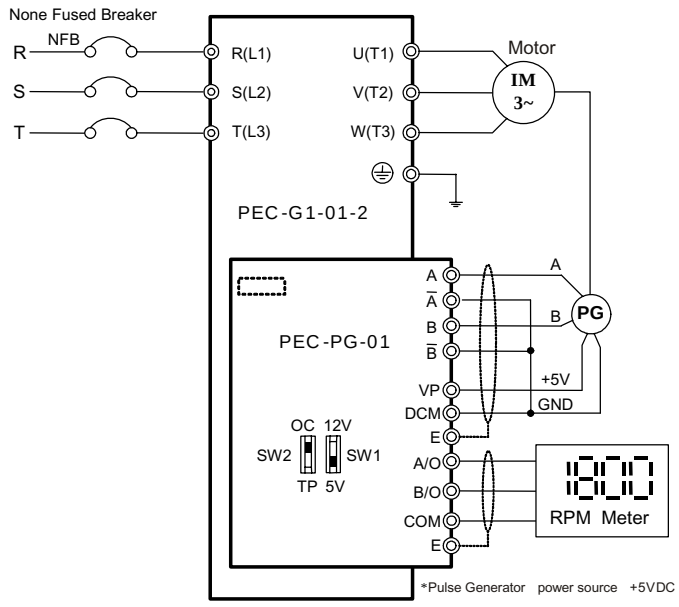
When Encoder is Line Driver type (12VDC), please wire as below.



PEC-PG-01 and Pulse Generator Connections

Fig.2

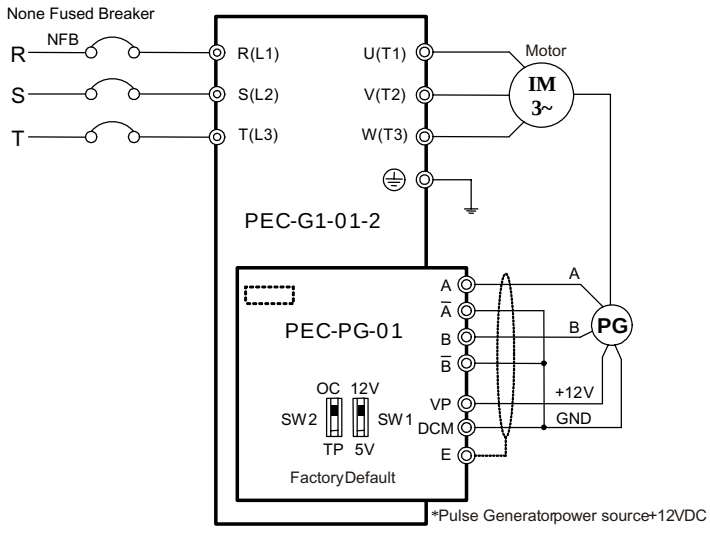
When Encoder is Open Collector type (5VDC), with RPM meter attached. Please wire as below.



PEC-PG-01 and Pulse Generator Connections

Fig.3

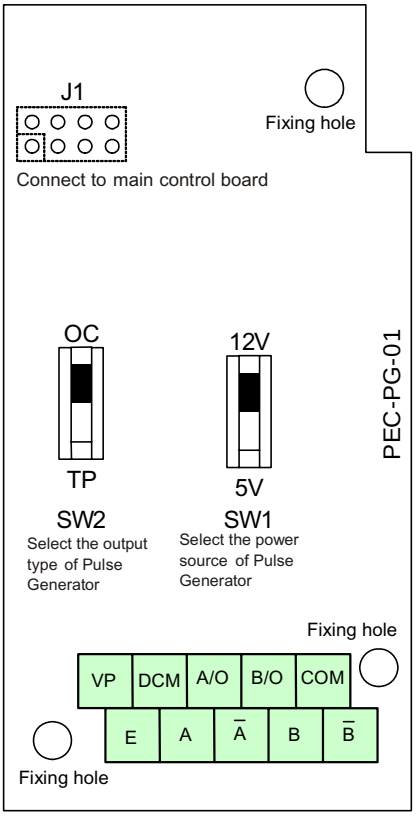
When Encoder is Open Collector type (12VDC), please wire as below.



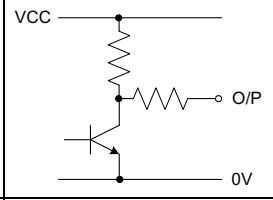
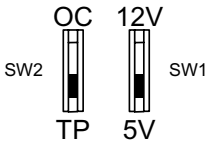
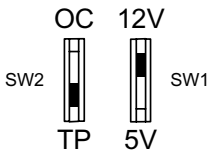
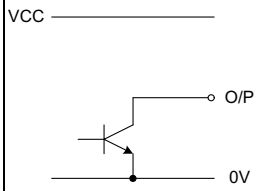
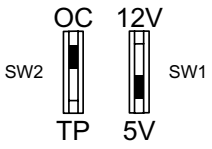
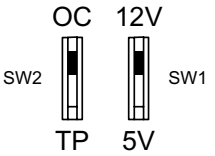
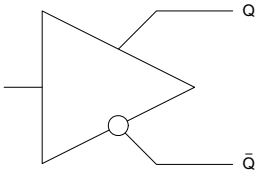
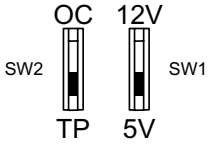
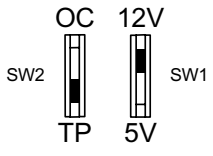
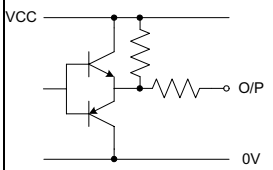
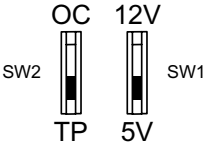
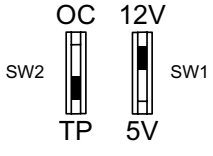
PEC-PG-01 and Pulse Generator Connections

Fig.4

PEC-PG-01 Explanations



Types of Encoder

Types of Encoder		Encoder power source = 5VDC	Encoder power source = 12VDC
Voltage Output type			
Open Collector type			 (Factory Default)
Line Driver type			
Complementary type			

Terminal Descriptions

Terminal Symbols	Descriptions
VP	Power source for Encoder (SW1 can be switched to 12VDC or 5VDC). Output Voltage: (+12VDC±5% / 200mA) or (+5VDC±2% / 200mA).
DCM	Common of Power source (VP) and input signal (A, B).
A, $\overline{A}$,B , $\overline{B}$	Input signal from Pulse Generator. Input type is selected by SW2. Maximum 500KP/Sec.
A/O, B/O	Output signal for external RPM Meter. Maximum 24VDC / 300mA.
COM	Common of Output signal (A/O, B/O) .
E	Connect to ground.

Wiring Notes

- ✓ Please use a shielded cable to prevent interference. Do not run wire parallel to any high voltage AC power line (220 V and up).
- ✓ Connect shielded wire to Terminal " E " only.
- ✓ Recommended wire size : 0.25~0.75mm^2 (AWG24~AWG18)
- ✓ In case the Pulse Generator to be connected is Voltage Output type, Open Collector type or Complementary Type, please connect $\overline{A}$,$\overline{B}$ & DCM together as shown in Fig. 4.
- ✓ Wire length:

Types of Encoder	Maximum Wire Length	Wire Gauge
Voltage Output type	50m	0.75mm^2 (AWG18)
Open Collector type	50m	
Line Driver type	300m	
Complementary type	70m	

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